COPY

AXIDERMY:

OR,

THE ART

OF

COLLECTING, PREPARING,

AND

MOUNTING

OBJECTS OF NATURAL HISTORY.

FOR THE USE OF

Museums and Travellers.

WITH PLATES.

THE SECOND EDITION.

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TAXIDERMY.

The art of Taxidermy has only made progress during the last sixty years. At the beginning of this period, the celebrated Reaumur published a memoir on the method of preserving skins of birds to be sent into distant countries. He formed a very beautiful cabinet of Natural History in his own house, which, after his death, became the basis of the collection of birds in the Museum of Paris. Experience soon proved that the means he proposed were insufficient for preservation, and availed still less for preparation. Reaumur received birds from all parts, in spirits of wine, according to the instructions he had given: he contented himself by taking them from this liquor, and introducing two ends of an iron wire into the body behind the thighs; he then fastened the wire to the claws, the ends, which passed below, serving to fix them to a small board; he put two black glass beads in the place of eyes, and called it a stuffed bird.

The larger animals, such as the *Saw-Shark*, the *Squalus Carcharias*, the *Crocodile*, were padded with straw, whence comes the term *stuffed*

(*empaillé*), for which we have substituted that of *mounted*: it does not perfectly express the idea we would convey, but it is always more correct than the former.

Some persons, struck by the appearance of these animals, tried to skin indigenous birds, and to mount them. They succeeded indifferently; the body was too forward, and the thighs came beyond the rump. It may be well to observe, that this fault always happens to those who mount a bird for the first time, even if they have received proper instructions.

Schœffer succeeded to these. This naturalist, after skinning them, contented himself by cutting the birds longitudinally in two, and filling one half with plaster: fixing the skin properly at the back of a box, of a depth proportionate to the size of the bird, he stuck in an eye, and replaced or represented the beak and claws by painting; he then carefully fixed a glass on this frame, to protect the object from insects. This method is still followed in Germany, but much improved.

A work appeared at Lyons, in 1758, entitled, "Instructions on the Manner of collecting and preparing the different Curiosities of Natural History." The author was the first who submitted some useful principles for Taxidermy; he ornamented his book with many plates, more than half of which are in all respects foreign to his

subject, as they simply represent shells, and other marine productions, with their descriptions. He inserted the Memoir of M. Duhamel entire, entitled, " Instructions for the Transportation by Sea of Living Plants, Seeds, &c." The author, in doing justice to the good intentions of travellers, complains that the stationary naturalists, and the curious, often, after great expense, receive things badly chosen and badly preserved, which they are obliged to throw away. He gives some very interesting details on this subject, but unfortunately he has too much neglected the method of packing fragile objects, such as *madrepores*, *star-fish*, *echini*, *butterflies*, &c.; for by a near calculation, we may, for those objects alone which we have just mentioned, value at one-fourth the loss which results from the improper manner in which they have been packed. We shall, in the course of this treatise, speak of the means of remedying this inconvenience.

In 1786, the Abbé Manesse published a volume, under the title of " Treatise on the Manner of stuffing and preserving Animals and Skins." He presented his work to the Academy, who made a favourable report of it. It contained some very useful advice, but the instructions it gave for mounting and preserving birds do not appear admissible to us, however seducing the author may have rendered them by excluding the use of poisons. In this we recognise the principles of hu-

manity which have always characterised him; we agree with him that those who employ arsenic are exposed to continual danger, but we must maintain the use of arsenical soap; and we will point out the means of defence against its fatal effects, expecting that Chemistry may discover a better preservative.

We also admit, that the alkalies adopted by the Abbé Manesse are not attended with any danger to those who employ them, and may preserve birds in the manner of our author; but he himself says, that in the time of a thaw, the birds are covered by the damp to such a degree, that the water runs along the feathers and claws. It cannot be otherwise, alkalies always having a tendency to attract damp; and when they are dissolved by this fluid, the salt liquor necessarily agglutinises the beards of the feathers, takes from them their velvet-like appearance, attracts and retains the dust; and in dry seasons the birds appear grey from the crystallizations of alum, and other salts, which fix on their feathers. It is not the same in preparing the skins of large quadrupeds; we do not yet know any means preferable to those which the Abbé indicates. But it must also be admitted, that those who know the principles of the new Taxidermy will never have the patience to employ fifteen or twenty days in mounting a small quadruped, a bird, or a caterpillar, when we can teach

them the way to mount a common-sized bird in less than an hour, and a caterpillar in five minutes.

The Abbé Manesse has rendered great service to science by excellent observations on the manners of animals. No one has known so well the eggs of birds, and their manner of laying; he also possessed a superb collection, ticketed with the greatest precision. He confided in himself alone, and would always see the male or female before he determined the species to which the eggs belonged. He neglected no information which might be procured either by correspondence or his own painful labours. At the age of forty-five years he climbed the highest trees, with the assistance of two hooks fitted to a pair of boots, and a girth which encircled his body and the tree at the same time.

In 1789, he had acquired a great number of notes on the laying of birds. At the request of M. Dorcy he decided to publish them, with plates of all the eggs which he knew. He had drawn a great part of them, and engraved three or four plates with much care; but the Revolution deprived us of this work. The author has since employed the period of his long emigration in new and interesting researches on the same subject, and has assembled a great number of interesting facts, on the manners and incubation of birds. He presented his manuscripts and drawings to the In-

stitute, in 1817, and all naturalists must await the publication with impatience.

Mauduyt has given a memoir on the manner of preparing dead birds for forming collections. (See la 5eme Livraison de l'Encyclopedie Methodique, Histoire Naturelle des Oiseaux, t. i. deuxième partie, p. 435.) By studying his method we may, with perseverance, be able to mount birds well, although he had never prepared them himself; for he has composed his memoir from the notes which Lerot furnished him, who mounted them very well, and who merited the confidence which Mauduyt had accorded him, in all the preparations which his fine collection required.

Mauduyt, however, did not point out any means of preservation. Sulphurous fumigations appeared to him the *ne plus ultra* for killing destructive insects. Sulphur does still more, it destroys the skins themselves. Notwithstanding this havoc, Mauduyt persuaded Daubenton to adopt the use of sulphur for the collection in the Museum of Natural History. At M. Dufresne's entrance into the establishment, he, with great difficulty, obtained the suppression of it, but it was too late. About 3500 birds now ornament the gallery of the Museum, and there are not more than ten of this number from the old collection; their upper parts were burned, the sulphurous vapour had changed the red into a dirty yellow, faded the yellow, blackened the blue, soiled the

cases and even the glasses which inclosed them. Notwithstanding these inconveniences, we do not entirely renounce sulphur; we shall point out means of using it properly and with security; but for *Mammalia* only.

Birds have had the preference over all other animals, from the richness of their plumage and the elegance of their forms. The desire of preserving their beautiful skin has given birth to Taxidermy; at least if we may judge by the preference naturally accorded to them by all those who have imbibed a taste for this art. He who can mount a bird properly may in time form a numerous collection, but he will be very far from extending it to all classes of animals. This truth is evident from the comparison of all the cabinets in Europe with that of the Museum in Paris. In Germany there are few Museums composed of *Mammalia* and *Birds*. The Dutch are great lovers of rare birds: they have four or five collections of great interest, from the rarity of the species and the beautiful preparation of the individuals. An old sculptor, living at Lahaye, devoted himself to the practice of Taxidermy, and in a short time surpassed all those who had employed themselves in mounting animals, especially large *Mammalia*.

The Dutch, by fixing the animal which is mounted in a box proportioned to its size, supersede all other means of preservation. The interior of this

box is furnished with white paper, well pasted; in front is a groove, to receive a glass, fastened by four points and closed with putty. An aminal thus shut up will last a long time, unless the living germ of its destruction be shut up with it.

The English employ the same means of preserving their animals, but they do not mount them so well as we do. Besides, this manner of inclosing them prevents a methodical arrangement in a Museum; symmetrical order finds so many difficulties, that the eye and science alike lose sight of it.

It seems that neither the English or the Dutch have published any work which treats of the method of mounting animals according to system. In 1801 we were not more advanced than they were; what we possessed of this kind appeared insufficient to amateurs. Notwithstanding, many derived advantage from the Memoir of Mauduyt, but, being inserted in the Encyclopédie Methodique, it was not always easy to procure it. There was, besides, only the work of the Abbé Manesse, and the tediousness of the means which he pointed out, frightened all those who desired to learn Taxidermy. The Professors of Natural History to the central schools of the departments, felt more than ever the want of a work which furnished the method of preserving and augmenting their zoological collections.

In 1802 their wishes were nearly accomplished for there appeared almost at the same time two work. on Taxidermy, the one by M. Nicholas, a chemist the other by M. Henon. M. Nicholas makes ar analysis of all that had been said before on the preparation of animals. This review comprehend: nearly half the volume. Like the Abbé Manesse he renounces poisons as dangerous to the preparers and insufficient to avert the destructive effects o' insects on zoological collections. He pretends that with his soapy pomatum and tanning liquor, stuffec animals are preserved a long time. The drugs which compose his preparations do not injure those who use them. We allow that this is not the case with the metallic soap, and supposing M. Nicholas's preservative equally efficacious, we should certainly give it the preference, but we have tried it without success. We are therefore obliged to retain the arsenical soap: M. Dufresne has employed it for forty years, and has never been inconvenienced by it. We may also instance Le Vaillant, Maugé, Desmoulins, and especially Bécœur, for no one in France has mounted as many birds as the latter.*

* He is a nephew of Bécœur's of Metz, who invented the metallic soap. Bécœur of Metz was the best apothecary in that city. He mounted fresh birds in the greatest perfection, and by a little practice one is sure to succeed with his method.

It remains for us to speak of a little work published by Henon and Mouton Fontenelle; they had at first no other object than to read their manuscript to the Athenæum at Lyons, of which they were members; they were earnestly solicited to print it, and published it in 1802. These authors speak of birds only: they describe an in-

He opened his bird in the usual manner, that is to say, by the middle of the belly; he easily took out the body by this opening without cutting any of the extremities; he then removed the flesh by the aid of a scalpel, taking the precaution to preserve all the ligaments; he anointed the skin, and put the skeleton in its place, carefully dispersing the feathers on each side. He run the head through with an iron wire, in which he had formed a little ring at nearly the third of its length; the smallest side passed into the rump, in such a manner that the ring of the iron wire was under the sternum; he then passed a wire into each claw, so that the extremities of the wire united to pass into the little ring; he bent these extremities within, and fixed them with a string to the iron in the middle of the vertebral column. He replaced the flesh by flax or chopped cotton, sewed up the bird, placed it on a foot or support of wood, and gave it a suitable attitude, of which he was always sure, for a bird thus mounted could only bend in its natural posture. He prepared quadrupeds in the same manner. If this man, so favourably known (since he created the art of Taxidermy) had not invented the arsenical soap, we should not now have the pleasure of seeing in our cabinets many birds mounted by him sixty years ago and still in very beautiful preservation.

finity of methods practised by others, and compare them to their own, which without doubt are preferable, but too slow to satisfy the impatience of ornithologists.

The oil of turpentine is almost the only preservative which they employ. They use it in two ways. First, by soaking, with the aid of a brush, the roots of the feathers in all parts of the bird after it is mounted: the second method, which is not so good as the first, consists in varnishing the whole surface of the bird, which secures its preservation. It must be allowed, however, that the spirits of turpentine absorb and tarnish the colours. If the first method be executed with all the care it requires, that is to say, if the spirit have only wetted the quills and down of the feathers, these parts will be preserved; but their extremities will be attacked and destroyed by insects. This proceeding appears to us to be difficult to put in practice for the smaller birds, because the oil, which has the quality of spreading with much rapidity, quickly reaches all parts of their feathers, and thus only preserves them at the expense of their colours, so rich in the greater part of the small birds which come from Africa and South America.

It is necessary to use the oil of turpentine for the exterior of large *quadrupeds*, and *fish*; first, because the metallic soap cannot penetrate; and,

secondly, because prudence does not allow us to employ it on the surface of any animal, not even on the parts free from hair. *

We have thought it indispensable to enter into some details on the methods hitherto proposed and admitted, in order to point out the progress of Taxidermy. We now pass to the description of our own methods, and will commence by giving a list of the tools and other objects with which it is necessary to provide ourselves. We shall add to it the receipt for the preservatives which we employ, and, adopting M. Cuvier's divisions for the sake of order, we will treat, with detail, on the means of preparation and preservation peculiar to certain animals; for it is proper to remark that the *rat*, the *deer*, and the *elephant*, require very different methods for their preparation.

* M. Dufresne means the exterior surface *only*, which is so much handled in the stuffing as to make it too dangerous to anoint it with this soap; and I observe, that the artists in the Zoological Laboratory at Paris carefully bend or turn down the points of the various wires, after they have inserted them, (as they easily straighten them again with the fingers, if requisite,) lest, by pricking their fingers, the arsenic might do them serious injury. M. Valenciennes, however, assures me, that it is indispensably necessary for the traveller to anoint the naked parts of the legs of birds killed in hot climates.

Articles necessary for mounting Quadrupeds, Birds, Reptiles, Fish, &c.

1. An assortment of iron wire of all sizes.

2. Flax or tow, or, for want of it, the commonest cotton, or the ends of untwisted cords. We must never use marine plants without having well steeped them in fresh water. Without this precaution, the marine salt with which they are impregnated, and which retains so much humidity, would rot the skins that are stuffed with them.

3. A box containing scalpels, scissars with pointed blades, and two or three pointed forceps of different sizes, one of which ought to have indented extremities.

4. Two flat pincers, large and small.

5. A round pincer.

6. A cutting pincer (for the wire).

7. A hammer.

8. Two files.

9. Brushes of different sizes, for putting the drugs on the birds, smoothing the feathers, &c.

10. A collection of eyes in enamel. We find these at Agard's, Rue Aumer, and at Noël's at

Savoy, near Paris. At the end of this treatise we will point out the method of making them. *

Receipt for making Arsenical Soap, invented by Bécœur, Apothecary at Metz.

Camphor - - - -	5 ounces.
Arsenic, in powder - -	2 pounds.
White Soap - - -	2 pounds.
Salts of Tartar - - -	12 ounces.
Lime, in powder - - -	4 ounces.

Cut the soap in small slices, as thin as possible, put them in a pot over a gentle fire, with very little water, taking care to stir it often with a wooden spatula; when it is well melted, put in the salts of tartar and powdered chalk. Take it off the fire, add the arsenic, and triturate the whole gently. Lastly, put in the camphor, which must first be reduced to powder in a mortar by the help of a little spirits of wine; mix the whole well together. This paste ought then to have the consistence of flour paste. Put it into china or glazed earthen pots, taking care to place a ticket on each.

When it is to be used, put the necessary quantity into a preserve-pot, dilute it with a little cold wa-

* These eyes, however, are equally well made in England, although dearer. They cost, in Paris, from two sous to thirty francs a pair.

ter, until it has the consistence of clear broth; cover this pot with a lid of pasteboard, in the middle of which bore a hole for the handle of the brush which serves to anoint the animal.

Gum Paste.

Take half a pound of common gum-arabic, and two ounces of white sugar-candy; melt this mixture in a pot of water, then strain it through a linen or a horse-hair sieve. When it has become liquid, put a part of it into a flat preserve-pot, add a spoonful of starch or hair-powder, mix the whole well together with an iron wire or a long pin, which should always remain in the pot for that purpose. This gum serves for an infinity of uses, and never spoils. When it becomes dry add a little water to it; if you are in haste to make use of it, place the pot on warm ashes to melt it quickly, or put it into warm water or sand.

Paper Paste, gummed.

Fill a large coffee-pot with water, and unsized paper, such as is used for printing; boil it for two hours, renew the water, and boil it again for the same time. Then squeeze the paper, and pound it in a mortar until it be reduced to a very fine paste; then dry it, and when there is occasion to use it,

take some melted gum arabic, add the powder to it, and a large handful of pounded paper; mix the whole well together, and put it into a flat pot.

We shall presently point out the use of these different compositions.

In warm countries the skins of animals must be prepared without delay; even in the places where they are killed, and with very few tools. For these occasions we will instance M. Maugé, who, in the voyage round the world which he undertook for the sake of Natural History, only carried a box of scalpels; he nevertheless prepared a great number of birds and quadrupeds, received by the Museum in 1803. It is true the animals were only skinned and half stuffed; and this operation being the most simple, required fewer implements than to mount and prepare them; but it is quite as much as a traveller ought to do in his distant expeditions, because the objects are quickly arranged in this state, and are very easy to pack.

Of the Chace.

A double-barrelled gun is to be preferred; one of the barrels loaded with small shot or the dross of lead, for little birds, and the other with large shot. It must be observed, that the barrel destined to kill small birds ought to be loaded with

much less powder and shot than usual, not to injure them or tear any part from them.

Before starting for the chace, it is necessary to be furnished with several rolls of paper; a large handful of cotton or flax; powdered dry earth, or ashes. *

When a bird is killed put a pinch of dry dust on the fresh wound; this is done by raising the feathers with a long pin at the place of the wound. Introduce a little cotton or flax in the beak of the bird, to prevent the blood from coming out of this opening, and keep it as clean as possible. Place the wings, and the feathers which have been disturbed, in their natural position; rest the bird on the ground to give the blood time to coagulate; take a sheet of paper, in the form of a horn or hollow cone, into which you must introduce the head with care, holding the bird by the claws and tail; then close the horn with precaution, and place it in a box filled up with moss and dried leaves, (to prevent the bird from being shaken about in the chace,) and put the box into the game-bag.

The birds taken with a net, trap, or other snares, are always preferable for mounting, but these methods generally procure small ones only. We can

* The French expression is "terre franche;" any earth free from humidity and vegetable matter will do.

also preserve those which have been taken with bird-lime, taking care to remove it with alcohol, or, which is better, with ether, which is easily done by slightly rubbing the feathers that are smeared by the bird-lime with small pieces of rag or cotton, changing them several times until the bird-lime is wholly taken away. In the summer it is necessary to skin the birds on returning from the field, or, at furthest, the next day, otherwise the putrefaction would occasion the loss of the feathers; but in winter it is possible to defer it for some days. M. Dufresne has mounted one at Paris which had been sent from the Lake of Geneva, and which was still very fresh. In southern countries, Africa, America, &c. we must prepare the animals in the places where they have been killed.

PREPARATION OF MAMMALIA.

1. *Of Man.*

All the efforts of man to restore the skin of his fellow-creature to its natural form and beauty have hitherto been fruitless; the trials which have been made have only produced mis-shapen hideous objects, and so unlike nature, that they have never found a place in our collections. We have only some parts of man, either dried or preserved in spirits of wine, sufficiently entire to be recognised.

In several Museums we see human heads injected, and preserved in oil of turpentine. The anatomical collection of the Museum of Natural History in Paris possesses a head prepared in this way more than a hundred years ago, by the celebrated Ruitch, a Dutch physician. It still preserves all the vivacity of its colours. The cold so far affects the liquor in which it is contained, as to hide it completely, but at the return of spring the liquor becomes clear, and we distinguish the object perfectly.

Without doubt all these preparations are very useful to science, and are even necesssary to the demonstrations of professors. Human skeletons are more so, and since the bony part of our body is the only one which we are able to preserve entire and in its natural position, we will try to describe the different methods employed for this purpose in the present day.

According to the methods which they use, anatomists distinguish two sorts of skeletons; one which they call natural, and the other artificial, and these two methods are sufficient to obtain the skeletons of all animals.

Of Natural Skeletons.

This first manner is the easiest and most general; it is particularly employed for small animals that

is to say, of the size of a *fox*. Skin the animal, take away its flesh, separating the head only, to take out the brain more easily by the occipital hole. When the flesh is separated from the bones, put the whole of the skeleton to macerate in a vessel of water, with a little quick-lime added, which has the property of whitening bones. After two or three days' maceration, the skeleton is extended on a table, and by the aid of a scalpel all the remaining flesh is scraped off. If the solid parts adhere too much, the skeleton is again put to macerate, until the bones are completely cleaned, taking every precaution to preserve all the ligaments which fasten the bones one to the other. These ligaments acquire much consistence when they are dry, and are sufficient to keep the skeleton upright, when it is a small animal. If there be any reason to suspect that they will not, an iron wire is passed longitudinally through the vertebral column from the end, which must pass out anteriorly, to fasten the head to the cervical vertebræ. Two forks are formed, the one to support the anterior part, the other for the posterior: for this two pieces of iron wire are taken, the height of the animal; they are twisted together, leaving a fork at each extremity, and are both fastened on the board destined to receive the skeleton. The one ought to pass, or enter, the ribs, and encompass the vertebral column between the shoulder blades; the other between the bones

of the pelvis. Notwithstanding these precautions, it sometimes happens that pieces of the skeleton detach one from the other; in this case two holes are pierced in the separated ends of the bones, and they are reunited with fastenings of brass wire. Such is the method employed for the skeletons of *reptiles*, *fish*, *birds*, *small mammalia*, and *children*.

Of Artificial Skeletons.

The skeletons of men and animals of middling size cannot be set up in the manner last described, and more skill is required to form them. We begin, in the same way as for the natural skeleton, by taking off as much of the flesh as possible, but we must separate all the bones at their joints, before putting them to macerate: on account of their greater size they ought to remain longer in the water. We renew the scrapings until they are perfectly cleaned: then expose them to the sun to whiten, and take care to turn them every day. The most difficult part of the operation follows, which is to re-assemble all the bones, to reunite them, and to place them in their natural position. Beginning by one of the extremities we make holes at the apophysis *, by the help of a wimble, or a lathe; sometimes with the

* The apophysis is the ball or round end of the bone, marked A. plate I.

gimblet. Fasten all the bones with an iron or brass wire, which we pass through the holes already bored. Twist the two ends of the wire, leaving a little play between the articulations, and pursue this method until the whole skeleton is mounted. We then procure a flat piece of wood to place it on, and keep it erect by means of two iron uprights, such as we have described for the natural skeletons. *

The links of wire above mentioned are insufficient to unite all the bones of large-sized animals, such as the *horse*, the *ox*, the *camel*, and the *elephant*. We substitute two iron pegs, with a head at one end and a screw at the other; each screw must have a nut, and each pair of screws must be accompanied by a plate of iron, narrow, and pierced at each end, to pass the screw through. We will now suppose ourselves about to unite the bone of the thigh to that of the leg of a large quadruped. We pierce a hole at about two inches from its extremity, we do the same with the leg-bone, bring the two together, and passing one of our screws (longer by an inch than the bone is thick) into the hole of one of the above-mentioned plates, then through the bone,

* See the drawing of one of the specimens in the Gallery of Anatomy, plate 1., the wires in which are coloured red, to distinguish them. I have removed the head a little too far from the cervical vertebræ, to show the course of the wire which joins them more clearly.

and lastly into the other plate, we tighten them by the aid of the nut; doing the same by the leg-bone, the two parts will be united and supported by the two plates, which are retained by the iron pegs or screws, and the play or space between the two extremities of the bones will have been provided for, by the distance left in piercing the holes for passing the pegs through.*

As these vast frames are more often set up for instruction, than for the gratification of mere curiosity, it is customary to saw the head longitudinally in two, except the under jaw; the reunion of the parts is effected by an iron hinge, which permits them to be opened at pleasure, for the study of the interior of the head.

Monkies.

In all systems *monkies* are placed immediately after *man*.

Before we begin to skin an animal, we must fill its mouth with flax; if there be any wound capable of letting out the blood, cotton or tow must also be introduced into it. This done, we stretch out the animal on its back, and taking precisely the middle

* See fig. 2. plate 1. a. is the iron plate, b. is the nut which tightens the screw of the iron peg, c. is the head of the second iron peg, the nut and screw of which, similar to the first, is of course on the other side.

of the abdomen, turn back the hairs to the right and to the left, and open the skin in a line from the arch or hollow of the pubis to the stomach; we may even prolong the opening as far as the collar bone, but as we acquire more dexterity, we are able to decrease or shorten it. Great care must be taken not to injure the muscles of the belly, or the intestines would fall out and soil the skin; we must also, in cutting the skin, pay attention to the arrangement of the natural parts, to be able to render them apparent in the preparation. These precautions taken, we separate the skin from the flesh, both to the right and left of the belly, (placing pads of tow or linen between it and the body as we separate it,) as far as possible towards the posterior part. We disengage the anus, which we separate from the rectum; we cut the tail interiorly, and then separate each thigh at its junction with the bones of the pelvis. Until this moment the animal has remained on its back, but we must now lay it on its side, the posterior part to the left, and the paws turned towards us. In this position the thighs, being separated, recede towards the right, and give more facility for skinning the back; this last part is always the easiest. It is sufficient, for quadrupeds of a middling size, to take the skin in one hand and the body in the other, and by drawing them in contrary directions, to unskin the body as far as the scapulæ, or rather to the

shoulders. When we have arrived thus far, we cut the arm at the shoulder joint, then disengage or separate it from the body, put it again into the skin, and turn the animal to perform the same with the other side. We continue to unskin the neck, and pass the head from within the skin, with the help of a scalpel. We unskin the head as far as the end of the nose, taking care to cut the ears as near as possible to the skull; we must also be particularly careful not to injure the eyelids, and not to cut the lips too close.* When this is all done, we separate the head from the trunk, taking away the muscles in such a manner that all the bones which compose it may be naked or clean. We enlarge the occipital hole by means of a sharp instrument, and scoop

* Suppose the slit in a common slide purse to represent the opening we have made in the skin of the animal, and the closed length of either end, the neck; if we take a small glass stopper, and push it, with the head uppermost, to the end of the purse, its neck representing the cervical vertebræ, we have the precise situation of the animal: to pursue the operation, suppose the *head* only of the stopper to have been thickly covered with strong gum-water, so that the end of the purse, representing the skin, adheres pretty firmly to it; we take the *neck* of the stopper between our fingers, and pulling it downwards towards the slit of the purse, we exemplify the rest by gradually disengaging the purse from the head of the stopper, until it adheres only at the tip, as we disengage the skin from the head of the animal until we reach the muzzle; we conclude the exemplification by drawing the end of the purse (which we have thus begun to turn inside out) back again.

out the brains; the handle of an iron fork is very proper for this operation. When the head is well cleaned, we put it back into the skin; we then take one of the fore-legs and skin it as far as possible, always drawing it towards us, and pushing the skin the contrary way; that done, we take away the whole of the flesh, carefully preserving the ligaments which unite the bones, then replace the leg in its skin, and operate upon the other. We afterwards treat the hind legs in the same way, that is to say, skin them as far as the claws, separate the tendons and ligaments from the muscles, leave them adhering to the articulation of the knee, then take all the flesh off the bones, and thrust the leg back into the skin.

It only remains for us to skin the tail, which is the most difficult. To enable us to do so, we must disengage or bare the first two or three joints; we tie them strongly with a cord, which we fasten to a cramp iron or to a wall hook; we pass a cleft stick between the cord which holds the tail and the skin, that is, on the bare joints, which are, of course, placed within the cleft; with a hand on each side we draw the stick towards the extremity, and the tail comes out of its sheath. We extend the skin well upon the table, stretching out the paws, take away all the muscles which remain inside the skin, and, thus prepared, it is ready for stuffing.

We will suppose the quadruped on which we oper-

ate to be of the size of a fox, in which case, we take an iron wire of such a thickness that four pieces introduced into the legs can support the animal. We then take a piece of about two feet long, but thinner than that destined for the paws, to enable us to form what we call a tail-bearer. We must bend this piece of iron wire at nearly one-third of its length, to form an oval of it, smaller than the hand; twist the two ends together, leaving one of them a little shorter than the other, then, measuring the iron by the skinned tail, we cut it the same length, independent of the oval. This measure exactly taken, we wrap the wire in flax, taking it by the point and turning it round between the fingers, constantly increasing the flax towards the oval. Rub the flax of this tail-bearer with a little flour paste, to preserve the shape, and it then has the length and circumference of the skinned tail: it must afterwards dry: introduce a little of the preservative into the sheath or skin of the tail with a small brush; we also rub the tail-bearer with the preservative, and put it into the sheath; the oval, which is now placed within the body, serves to fix the tail to the iron which replaces the vertebral column.

We take five pieces of iron wire of the diameter of a straw, one of which must be a foot longer than the body of the animal, the others must be as long as the legs. We sharpen one

end of each of these five pieces, and the point should be triangular, in order to penetrate the more easily. At the unpointed extremity of the longest of these five pieces, we form a ring, large enough to pass the little finger through, bending the wire back on itself a turn and half with a round pincer. We form a similar ring on the same wire, so as to come between the animal's shoulders, and, to be sure, we measure it on the body itself; this last ring is formed by one entire turn. The rest of this iron stem must be quite straight, and pointed triangularly at the end. The irons thus prepared, we provide ourselves with a quantity of chopped tow, and some little sticks or pieces of wire, with which we thrust in this stuffing.

The skin of the *monkey* being extended on the table, we take the end of the nose with the left hand; thrusting it again into the skin, we receive the bony head with the right hand, which we have introduced into the neck. We anoint it with the preservative, and then introduce some chopped flax, with pincers or forceps, about every part of the head, where flesh or muscles existed. After which we pass the long piece of iron wire into the middle of the skull, anoint the skin of the head with a small brush, and restore it to its place. We then anoint (always on the inner surface) the skin of the neck, and stuff it with chopped flax, not putting too much, for we should increase the size beyond its

proportion, since a fresh skin easily dilates, and we should then find it difficult to give the form and attitude suitable to this part of the animal.

The first ring of the wire which passes into the head must be in the direction of the shoulders, the second ought to correspond with the pelvis, or a little towards the posterior part. We then pass one of the irons for the paws along the front leg, behind the bone; the point which passes without ought to be under the highest ball of the foot. This done, we draw up the bones of the leg within the skin of the body, to tie the iron wire to the bone of the arm and fore-arm with pack-thread. We anoint these parts, and twist chopped flax round them, observing to make it equal to the flesh we had removed.

To fix the fore-legs, we pass one of their pieces of wire in the little ring of the middle or horizontal wire, and do the same with the other side, and then twist the two ends strongly together by the help of flat pincers. We must observe that, for an animal of the before-mentioned size, the pieces left to twist must be from five to six inches. Being twisted, we bind them on the under side against the wire of the middle or body, and fasten them by tying them together with pack-thread; we then replace the two legs, bending them according to the attitude that we wish to give them. We anoint the skin of the belly and scapulæ, which we stuff, taking care to put a good layer of flax under the wire of the middle.

We must also begin sewing the anterior part of the opening, giving the appearance of scapulæ, and more particularly that thickness which appears beyond, at the junction of the shoulder and bone of the arm.

The irons for the hind-legs ought to be longer than those of the fore-legs. We pass one of them into the paw, fastening it loosely to the bone of the thigh and that of the leg.

We place the flax to form the leg and thigh as before, and encircle it with a long needleful of thread, to prevent it from slipping up when we return this part into the skin: we operate in the same way upon the other thigh.

We afterwards fix the hind-legs by passing their pieces of wire in the second ring of the centre or body, and situated at the pelvis; we bend the two ends, twisting them to the right and the left round the ring, and, for more solidity, pass a piece of pack-thread several times round these three wires, and tie it strongly; we then place the tail-bearer in the manner we have before described.

This iron work being thus terminated, we anoint the thighs, and finish filling them with chopped flax. We renew the anointing of the interior parts of the skin, and replace the body of the animal by chopped flax, laying it conveniently under the irons, and accommodating the skin of the belly which easily stretches. We finish by making a seam

which reunites the skin at the place of the incision, taking care to divide the hairs, and not to take them in with the sewing, which ought to be made within and without, and then covered again with the hair.

Before putting the animal on its feet, it is necessary to bend the legs at the articulations: we turn the animal in all directions, to knead or press it in every part, in order to give the appearance of the various muscles.

We prepare a board, in which we pierce four holes, at distances suitable to the attitude we wish to give the animal, and put the irons from the four extremities into them, drawing them with the pincers until the feet rest firm upon the plank. We fix the irons below with wire nails, half driven in, which we then turn back upon the wires to prevent them from moving. The animal being upright, we give the attitude to the head, and make the muscles appear by stuffing it afresh with cotton at the eyes, the mouth, the ears, and the nose, and even the anus. If we find these places too hollow, we thrust in an iron peg, and bring forward the flax of the interior, to make this hollow disappear.

We are obliged to place the enamel eyes whilst the eyelids are still fresh. This operation requires much care, for the beauty of a stuffed animal depends chiefly upon the head. We then arrange the lips, and fasten them with pins; we are often

obliged to support them with cotton, especially when we wish the mouth to be open, and we remove the cotton when these parts are dry. We must not forget to thrust an iron peg into the nostrils, and to put a great deal of the preservative and closely pressed cotton into them; without this precaution the nose, in drying, would have a very bad effect.

To place the ears properly, if we would have them upright, we pass a connecting thread through their base, and tighten it until they are sufficiently drawn together. If the animal has large ears like the *roebuck*, the *hare*, &c. it is good to put a piece of pasteboard within, having the form of the ear, and we fasten it with small pins at the edges; a thin piece of cork is preferable to the pasteboard.

An animal thus finished must keep, if we have sufficiently applied the preservative. But if this composition has not penetrated to the ears, the nose, the lips, and, above all, to the paws, we must supply its place by imbuing these parts with a brush dipped in spirits of turpentine; and that this liquor may not injure the hair, we wipe it afterwards with cotton, and repeat this operation seven or eight times, at intervals of some days.

When we feel certain that the animal is dry, we cut the wire which passes from beyond the head, with pincers; we procure a board or *plateau* pro-

portioned to its size, and make four holes in it, in the same positions as those which we had bored in the temporary board. We introduce the irons of the paws, rivet them underneath, after having formed four little grooves, ending at the holes above the plank, that the wire lodging in them may not destroy the level of the *plateau*.

Those already in the habit of preparing animals, may perhaps think that we have entered too much into the details, but we have thought this necessary to make those understand us who have not any idea of Taxidermy, and for the same reason we have employed the most familiar terms.

No one ought to be alarmed at the beginning, by the length of our proceedings; a little practice will enable any body to prepare and mount a quadruped, the size of a *fox*, in four or five hours.

M. Nicolas skins quadrupeds by the back, he unites the wires of the extremities to that of the body before placing them, which renders it very difficult to introduce this work into the limbs; and, besides, it is scarcely possible to form a leg well by stuffing it in his way, and above all by not preserving the *tendo Achillis*. The camphorated liquor which he recommends for imbuing the hair, must necessarily injure it; none of the animals mounted for the Museum have undergone this operation, and yet they have all preserved extremely well.

It is only after comparing and trying the different

methods hitherto known, that we think we have pointed out the best method of skinning, mounting and preserving a quadruped, and we may generally employ the same proceedings from the *mouse* to the *panther*, *tiger*, &c. Animals larger than these latter require a peculiar frame-work, as we will hereafter explain. There are also some species which require other precautions, of which we proceed to treat.

The Bat.

It is sufficient to prepare the *bat* as usual, but without any wire. We then lay it on a plank of soft wood, extend the wings, and fix them very equally with pins, at the parts of their articulations; when they are dry we form a sort of picture of them, which we cover with a well luted glass.

During the day we may catch *bats* in the hollows of old oaks, in the crevices of walls, the ruins of buildings; at dusk we may kill them with a gun. France produces six or seven species, and we recommend travellers to bring them from all the countries they visit, even if they seem to differ but little amongst themselves. The Museum of Paris possesses a considerable number of them; but this genus is still far from being as much advanced as many others.

The Lemur Volans, (*Galeopithecus. Pallas.*)

This animal being as large as a pole-cat, and not having wings like the *bats*, but a sort of mantle which they extend by the extremities of the four legs, pins are insufficient to fix them, and we use wire as with other quadrupeds. They are very rare, and only found, as yet, in the Molucca islands.

Hedgehogs.

Hedgehogs are mounted by the usual methods, but as these singular animals form themselves into a ball, by drawing in all their extremities, it is necessary to know how to give them that attitude. When the *hedgehog* is skinned, we lay on the preservative, and stuff it a little less than usual to ensure its bending; sew it up without putting in any wires, and it will be sufficient to draw the head and four feet together under the middle of the belly. Then, to preserve this form, we place it on its back in the midst of a large cloth, the four ends of which we tie strongly together, and hang it on a hook in the air to dry. Some beautiful species are found in Madagascar.

Bears.

The size of a bear requires that the wire should be placed in a different way.

We take a plank, an inch thick, two in width, and the length the same as that of the animal, to go perpendicularly from the shoulders as far as the connection of the thighs to the os pubis. We pierce a hole on the surface of the plank, three inches distant from one of its ends, and form a connecting groove, running from the hole on the upper surface of the plank, round the end, to the same hole on the lower side. This groove ought to be made with a large gimblet, nearly the thickness of the iron wire which we employ, and which it is to receive. We then pass the wire by the hole through the plank, and leave one of its ends just long enough for it to be twisted with the other at the edge of the plank; we bend the iron into the groove, twist the two ends strongly together, and put some wire nails obliquely into the groove, in such a manner that their heads are bent upon the wire, so as to prevent it from shaking. The longest end of the wire ought to be at least eighteen inches, and pointed, so as to enable it to pierce the skull of the bear.

To fix the fore-legs to this bar or plank, which

is substituted for the central wire we have before described, we pierce two holes in it, the one *two*, the other *three* inches, from the end, and both a little higher than the first-mentioned hole on the broad surface of the plank. We make two similar holes at the other end to receive the wires of the hind-legs.

As the *bear* always walks on the sole of his foot, we bring out the wire of the legs at the claws. When the leg is stuffed, we bend the wire in a right angle, at five inches from the inner end, which we put into one of the holes of the plank; the part which passes out at the other side we curve afresh; we pierce two small gimblet holes close together, which receive a much smaller wire, and the ends of which, being twisted together, enclose the two ends of the large wire and bind them against the plank. We do the same with each of the other legs, and finish the whole in the same way as the smaller animals. This method appears to be the least difficult, and is practised in the Museum for animals of the second size, as the *lion*, the *royal tiger*, the *tapir*, the *deer*, &c.

Hares.

When we wish to mount a *hare*, seated, or upright, an attitude which it sometimes assumes,

we make an oval of iron wire, fix it to the interior iron work after having passed one end through the anus; this exterior end crosses the plateau on which the hare is to be fixed; the irons of the hind paws must pierce through them, and be fixed on the plank very near the posterior part.

Beavers.

Beavers ought to have the back very round and short; we cut the tail underneath, remove all the flesh, which we replace by chopped flax, and introduce a little of the preservative. They are found in North America, and in the South of France.

Ant-Eaters.

The *Great Ant-Eater* has a tail like the long beards of a feather pendent on each side of the stem, and raised upon the back. We cut it longitudinally to skin it, and the tail-bearer must be much longer than that of other animals; it is also necessary to make the tongue come out, which is very long in this species. The *Ant-Eaters* are found in South America.

Armadillos. (*Dasypus.*)

These animals do not require any preservative, because they are destitute of hair.

Elephants.

We are now arrived at the largest animals, the most expensive, and the most difficult to mount.

A detail of the necessary proceedings for mounting an elephant would be too long for description, and we will limit ourselves to an extract of those which have been resorted to for that which is now in the Museum at Paris.

The corpse of the elephant having been extended upon the ground, facilitated our taking and writing all its dimensions: the thickness was taken by a sort of rule which M. Lassaigne, cabinet-maker of the Museum, invented at the time; this instrument resembled the rule used by shoemakers, on a large scale. The curves of the back, the belly, &c. were taken by bars of lead, three quarters of an inch thick. This metal not having any elasticity, accommodated or bent itself to the curves we wished to measure, and preserved the measurements until wanted. M. Desmoulins drew the animal on one of the sides of the wall, according to all these mea-

surements, in the work-shop, where the model was to be constructed in its natural size. This done we proceeded to the skinning of the elephant, which we were only able to place upon its back by means of four-corded pullies, fastened to the platform. In this position we made an incision in the form of a double cross; the middle line went from the mouth to the anus, the two others were directed from each left foot to the opposite right foot; the tail and trunk were opened underneath, longitudinally. We scooped out the soles of the feet within an inch of their edge, that the nails might remain in the skin; to effect this we were obliged to employ the chisel and mallet. This operation was very difficult.

After four days' labour of several persons, we separated the skin from the body, it then weighed 576 pounds; we extended it on the ground to take away the cutaneous muscles which adhered to its interior, particularly to the head. In this state the skin was placed in a large tub; we spread a considerable quantity of pounded alum in all its folds; we then boiled some water with such quantities of alum that some pieces still remained at the bottom of the boiler, that is, we more than saturated the water; this water was poured upon the skin, and we continued to do so, until the skin was covered with it six inches deep.

To render the dimensions of the model or shape

which was to receive the skin more exact, we modelled one half of the skinned head in plaster, as well as one of the hind and one of the fore legs.

All these measures being taken, Lassaigne constructed a factitious body in linden wood. The reader would find the detail too long and too minute if we were to describe the ingenious methods generally invented by Lassaigne, either to cut the wood, or to preserve the form he had given to this great mass. But to avoid all prolixity, it will be sufficient to observe, that he composed this wooden elephant in such a manner that all the parts could be separated. He opened a pannel (it is immaterial on which side of the body) and introduced himself into the interior, by means of this opening, either to diminish the thickness of the wood, or for any other purpose during its construction: the head, the trunk, all was hollow, so that the body, alarming at first from its supposed weight, might be easily transported from one place to another. *

After taking the alum-water from the tub where the skin was placed, we heated it, and poured it boiling on the skin; we left it an hour and an half

* I have seen this immense model, which is now moved from the Menagerie to the Gallery. Its sides are not much more than an inch thick; the folds or wrinkles of the skin were adjusted after a beautiful little cast belonging to M. Cuvier.

in this state, after which we drew the skin out to place it quite warm upon the shape. This was not an easy thing, but it was rendered still more difficult by our finding the false body a little too large; the skin would not entirely cover it, there was but one thing which could be done; we could not diminish the wood without destroying the proportions, besides, the iron pins, the screws which fastened the work, would have lost their hold, and we should have run the risk of overturning the edifice. We then took down the skin, placed it on tressles, and diminished the thickness of it by the help of large knives, cutting it away in thick and long shreds from the whole of the inside. This work occupied five persons for four days. We weighed these shreds, and they amounted to 194 pounds. During this operation, the skin had dried, and consequently lost its suppleness. We put it back into a tub, and covered it with soft cold water; the next day we placed it afresh on the shape, and fixed it with wire nails and large brads; those which fixed the edge of the skin were driven in deeply, the others only half way, to accommodate the skin to all the sinuosities of the model. We drew out a great many of them when the skin was sufficiently dry.

This paring of the skin answered our purpose in two essential points, first, by facilitating the means of enveloping the model entirely, the form of which

had not been altered, and, secondly, by insuring its speedy desiccation. This last had not been the least alarming, for we feared that the humidity secreted in the skin might concentrate in such a manner (notwithstanding we had taken the precaution to give the wooden model a coat of oil paint,) as to occasion mouldiness in the parts exposed to the air. The alum with which it was saturated soon crystallized on the interior, which at first gave it a very ugly grey colour, but we entirely got rid of it by rubbing the surface of the skin, first with spirits of turpentine, and then with oil of olives. Thus the appearance of life was given to one of the largest animals on earth, and which till then had only been figured in our Museums as a hideous mass, and devoid of all resemblance to nature. The *camelopard*, the *couaga*, the *condoma*, (a species of *antelope*,) which are in the gallery of the Paris Museum, have been mounted in the same manner, which serves for most large animals.

Deer.

We now return to a quadruped of the second size. This ought to be mounted like a *bear*. We must put a bar of wood to receive the wires of the four legs, but the horns with which the head is ornamented will not allow us to skin it in the usual manner.

When we reach the neck, we cut it as near as possible to the head, and make another opening in the skin, beginning under the chin; we continue it the length of the neck, so as to be from eight to ten inches long. By this opening we separate the remainder of the neck, take away the tongue, and enlarge the occipital hole to take out the brain. We cut the lips as near as possible to the jaw bones; we continue ascending towards the forehead, and take the skin entirely from the head, except at the muzzle, where it will adhere. The head being well cleaned, we anoint it, and put the chopped flax in the place of the muscles which have been taken away, and we carefully replace the head; we must then sew up the opening made under the neck with very small stitches, that the hair may cover and conceal the seam. The rest is finished as we have already described for the bear.

All animals which have horns should be skinned like the deer; but the elk, which comes immediately after, must be mounted upon a wooden shape, as, from its size, it belongs to quadrupeds of the largest growth.

Seals.

These animals are amphibious, and have a very thick skin; consequently we must diminish it by

taking away as much as possible of the fat, and imbue it well with the preservative. The work of the inside must be made as for ordinary quadrupeds. Seals are always placed on the belly; thus we cut the wires close to the extremities. It is necessary to put some spirits of turpentine on the naked parts of the fins.

Cetacea.

The *porpoise* and *dolphin* differ but little from each other, and are very common in our seas.

We make an incision under the belly, from the chin to the insertion of the tail, detach the skin right and left with a scalpel, cut the vertebral column near the head, continue to disengage the body as far as the tail, and separate the trunk.

These animals have sometimes two or three inches of fat under the skin, and it is very difficult to take it all away at the first trial. We must therefore renew this part of the operation very often, and scrape away as much as possible with a cutting knife. To soak up the oil, which flows continually, we cover the parts with bran or powdered plaster.

The *porpoise* having a very smooth skin, without any apparent projection, there is no occasion for iron-work to mount it; a stick the length

of the body, which we put into the inside, and introduce a little way into the skull, is sufficient: we then anoint, and stuff the animal very close, that the skin may be well stretched; we leave its mouth open to show its teeth, which, in this genus, are very beautiful, and arranged with admirable symmetry.

We leave it in this state for two or three months, to dry. At that period the fat, or rather oil, will have penetrated the skin in several places, and the whole body will be covered with very ugly spots. To restore the skin to the gloss and freshness of life, and prevent the same inconveniences in future, we take a pumice-stone, and reduce it to a very fine powder; steep it in olive oil, and rub it thickly on the body with a hard brush; when we have rubbed over the whole body, we begin afresh, but this time we put emery into the oil. When we perceive that it begins to shine, we rub it dry with a piece of woollen stuff, which we renew to give the last polish.

Some people have recommended gum arabic, others white varnish, to restore the brilliancy of these *Mammalia;* but in rainy seasons the humidity expels the varnish and melts the gum, and in very dry seasons both fall off in small pieces; whilst our method of rubbing stops up all the pores of the skin, which thus always retains its freshness.

Whales.

The *spermaceti whale*, (Physeter, L.) and the *common whale*, (Balæna, L.) terminate the series of Mammalia. Their preparation would not be less interesting than that of other animals for Museums of Natural History, but the difficulty of procuring, and the expense of mounting, these enormous animals, joined to the room they take up, in some measure render the means useless which we might point out for mounting and preserving them; consequently we will proceed to treat of those quadrupeds which we procure in voyages or travels of great length.

Naturalists are, without doubt, much indebted to travellers whose interests call them into distant countries, and who, from taste, enrich their own with objects of Natural History. But how many precious objects would reach us from all parts of the world, if those who thus occupy themselves, had the necessary instructions to guide them in their researches.

Previous to starting for the chace, which in some parts must be prolonged for several weeks, or even much longer, the traveller should provide himself with a pot of the preservative, some large pincers, spirits of turpentine, needles and thread, scissars, forceps, scalpels, one or several knives, and, lastly,

a little hatchet. Cotton being very common in America, he should take a great quantity of it, and use it in preference to every thing else. In Asia and Africa he must employ tow, made from old ropes, and, for want of that, he might use moss or fine grass, well dried. M. Le Vaillant has told me that, in his travels in Africa, he used a species of dog-grass (very common in that country), with great success, for stuffing quadrupeds and birds. The greater part of the animals brought home by M. Le Vaillant were stuffed with this plant.

We will suppose our traveller's caravan, furnished with all the objects we have just named, has begun its march, and that he kills some quadrupeds; he will skin them without delay by the methods we have before recommended; it is sufficient for the skins to be anointed, stuffed, and sown up; he will put the spirits of turpentine on all their extremities, and let them dry in the most convenient place. At the end of three or four days, he will again renew the spirits on the same parts, particularly round the mouth of the quadruped.

We must here observe, that it is very advantageous to stay at least a week in the place he has chosen for the first halt, because of the pains required in the commencement of a collection; and also to be able to procure all which exist in its environs, for a large proportion of quadrupeds, birds, and even insects, canton themselves, and if he quits

the first place without procuring them, he runs the risk of never finding the same species again.

Before his departure he must be careful to deposit his collection in safety: he will examine each object separately, to ascertain if destructive insects (so abundant in warm countries) have attacked those parts where the preservative has not yet penetrated. If he perceives that any flies have deposited their eggs on the lips of his quadrupeds, he must kill them with spirits of turpentine; he may then pack all his objects with safety in a well-joined case, proportioned to the size of the animals.

It is of the greatest interest to science that the travelling naturalist should keep a circumstantial journal of the manners and habits of animals, for which he ought particularly to consult the inhabitants of the country. They have nature continually before their eyes, they see animals in their own domain, and the remarks they make cannot but be advantageous. Besides, a naturalist, with his head burthened with so many objects, cannot reckon much upon his memory; however great it may be, it may sometimes be defective; he ought therefore to consign every thing to paper.

When the traveller has arrived in those countries where he finds animals of the largest size; in Africa, for example, where he will meet with the *elephant*, the *hippopotamus*, the *camelopard*, the

qouagga, the *wild bull*, the *condoma*, the *oryx*, several species of *bubalus*; and when he tries to obtain and bring away the skins of these animals, he will doubtless meet with many difficulties, since it is often embarrassing to transport even the necessaries of life. But these obstacles, far from lessening the courage and perseverance of the zealous naturalist, will excite in him a fresh ardour; and, proud of the spoils of an animal which he can never hope to meet with elsewhere, he would deprive himself of every thing rather than lose the fruits of his labours. *

It would be very unfortunate, if a traveller, with such inclinations, was ignorant of the methods he ought to employ to preserve what may have cost him so much privation. We will suppose then that the animal killed is the size of an *ox*; he should make an incision under the belly in the form of a double cross; the middle line or cut must reach from the chin to the anus, the two others, crossing the middle one, must be cut from one foot to the other, as before, observing to make them all within-side the limbs, that the seams may be less apparent. When he mounts the animal, he must detach the hoofs with a hatchet, striking it above with a mallet or stone. The

* Le Vaillant brought the skin of a camelopard, which he had killed in Caffraria, more than 200 leagues from the Cape of Good Hope.

nails must remain attached to the skin. This done, he first skins the feet, legs, and thighs, and continues in the manner pointed out for the elephant. He must try, however, to preserve the bony part of the head, and in such a manner that it is only attached to the skin by the muzzle; although this operation will considerably augment the difficulty. He must remove every muscle from the head, and make the bones as clean as possible.

It is natural to suppose that the animal should have been killed far from any habitation, and consequently there is no opportunity of macerating the skin in alum water. Neither is it the time to make use of the arsenical soap, the leather being too thick to allow the preservative to penetrate; besides, the skin being far from its destination, it would be dangerous to those who touched it during the journey. The traveller must have a fire to cook provisions, which he must then make as large as possible, that it may produce a great many cinders, and when the skin is cold, he will take these cinders and sprinkle them over it on the inside, after having extended it on some boughs for the air to circulate above and below. If he has preserved the bony head, he will cover it again with its skin, and will not forget to put spirits of turpentine on the ears, lips, and four feet, several times.

This liquor dries easily, drives away destructive insects, and kills their larvæ.

In two or three days, when the skin is a little dry, he must turn it, putting the hair within, and if he has the means of procuring sea-salt, he will melt it in some water, and slightly wet the hair with it. It will be necessary to repeat this operation on each side of the skin, two or three times, at intervals of twenty-four hours.

When it is dry, the hair must be rolled inwards, beginning with the head, and care must be taken to put a layer of dried grass or moss to avoid the friction spoiling the hair in its conveyance. If the excursion be of long duration, it will be necessary to spread the skins sometimes in the sun, to look at them, and put the spirits on the places which may be attacked by *scarabæi*.

When the skins arrive at their destination, they require another preparation before being placed on a factitious body. The skin must be first extended on the ground, the hair underneath, to make it pliant; those parts which resist most must be moistened with tepid water.

It must then be placed in a tub or large bucket, and covered with cold water, saturated with alum by ebullition. Eight days afterwards it must be extended on pieces of wood half rounded, thinning it with the help of a large and sharp knife; this

operation is performed by passing the skin over the round surfaces of the demi-cylinders of wood, first paring those parts which are thus projected, and afterwards drawing the others into the same situation. When it is well pared and cleaned, it is put to soak four-and-twenty hours in a bath, composed half of soft-water and half of alum-water. It is then taken out to be spread upon the factitious body and fixed, partly by sewing, and partly by wire nails, as we have before described for the elephant.

BIRDS.

At least four hundred species of indigenous birds may be procured in France. He who can content himself with this collection, will be repaid by an acquaintance with the manners and habits of the birds of his own country. If his cabinet is less rich than that of another, his knowledge will be more solid: like the Abbé Manesse he will have an opportunity of forming a collection of eggs. This part, so intimately connected with the Natural History of Birds, has been very much neglected, hitherto, by the greater number of naturalists.

Whatever may be our inclination for indigenous birds, naturalists, and especially travellers, will find,

in our instructions, enough to assist their zeal for the preservation of exotics.

Manner of skinning Birds.

After having taken the precautions recommended when speaking of the chace, we pass a needle-full of thread across the nostrils, tie it underneath the inferior mandible, having the thread the length of the bird, to prevent the blood from coming out of the beak during the operation.

We have before said, that when a bird is killed, we must introduce a little cotton into its beak; we repeat this injunction, because the beauty of a mounted bird depends on the freshness of its head; it is easy to repair and clean the soiled feathers of the belly and back, but not those of the head without a great expense of time.

These precautions taken, we stretch the bird on the table, the head turned towards the left of the operator; we divide the feathers of the belly right and left with small forceps, pull out the down which covers the belly, make an incision in the skin from the commencement of the sternum or breast-bone until beyond the middle of the belly, raise the skin on one side by the forceps, and separate it from the muscles with a scalpel, approaching as near as possible to the wings; this done, we put a little floured or powdered cotton on the skin and flesh, that the

feathers may not stick to them; we force up or push out the thighs within the body of the skin, cut them between the femur and tibia (*f* and *t*, plate 2,) in such a manner, that the former remains to be afterwards pushed back into the skin. By the help of the scalpel and the fingers, we detach the skin as far as the rump, which we cut off. It is essential for this part to remain attached to the skin to sustain the tail-feathers. We then take the already uncovered part of the body with the left hand, and continue to separate the skin from the two sides; cutting some little tendons which we find before we come to the wings, with the scissars; we separate the wings from the trunk, at the junction of the humerus with the body, and restore them to their proper place. We continue to skin the neck, thrusting the head from within, as we have described for quadrupeds, and we uncover it, taking care not to enlarge the opening of the ears, and above all, to be particularly attentive not to injure the eyelids in taking out the eyes, which are easily picked out with the closed points of the scissars; we replace the eye with chopped cotton, with which we fill the orbits. We separate the neck, take out the tongue, and carefully remove all the flesh which is between the two branches of the inferior mandible. We enlarge the occipital hole, to extract the brain, by means of an iron instrument resembling an ear-picker; and, to finish cleaning out the inside of the

head, we pass cotton and flax into it several times; we must, during the operation, besprinkle the humid parts with plaster of Paris or dry earth, from time to time, to prevent the feathers adhering to them and becoming dirty, and also divide the feathers to the right and left for the same reason.

We then take out the wings, cut them off at the second joint, and, taking away the flesh, restore them to their place. This operation answers for small birds; and we anoint the wings in the parts which are destitute of feathers. We take away the flesh of the thighs, always preserving the bones of the leg, and put them back in their places.

If the bird be of a larger size, we must carefully take away all the muscles which adhere to the skin, as well as the fat, and if it has been killed by a gun, or holes are otherwise formed in the skin, they must be properly sewn up within. We fix a piece of thread to the first joint of each wing, drawing them together to the distance which they occupy when the bird is in flesh. This precaution, which does not appear to be of great importance, infinitely abridges the operation; for when the bird is mounted, the wings place themselves, provided they are properly tied within.

It is now necessary to arrange the skin: we begin by replacing the skull (which we have taken care to anoint well); with the left hand we hold the thread which ties the beak; we assist the head in

repassing into the neck with the forefinger of the right hand; at the same time we are pulling the thread on the opposite side, taking care that the feathers at the edge of the opening do not enter with the edges of the skin. We lay the bird on the table, the head to the left, place the wings and claws properly; we put a plate of lead of about a pound weight on the tail; we raise the feathers of the edges of the opening with the thumb and forefinger of the left hand to prevent their being soiled, and anoint the inside of the neck, introducing the preservative alternately with the flax without stuffing it too thickly, which is a fault in the greater part of mounted birds. We continue to anoint the back as far as the rump, and stuff it nearly one-third of its thickness, that the iron work may be placed on a thick layer of flax. We then prepare four irons, the proportions of which are equal to the size of the bird. The first, which is that of the centre, ought to be longer than the body of the bird; we form a little ring with the pincers at about a quarter of its length, and point the opposite end. This wire being oiled, we introduce it across the skull, passing it into the neck in the middle of the flax, with which it is stuffed; so that having crossed the skull, the ring of the wire is placed a little towards the anterior part and can receive the extremities of each of the wires which have passed through the thighs and claws, after being

pointed. This is effected in the following manner: we make a passage through the claw and bone of the thigh by the aid of a brass awl, the size of the wire we wish to employ; we pass the iron which is to remain in the leg of the bird across the knee, and bring out interiorly, putting it into the ring, and the same with the other side, and uniting the three ends, that is, the ends of the leg wires, and the end of the central wire beyond the ring; twist them together with a flat pincer, and lower them towards the tail. It still remains to form the fourth wire, which we call the tail-bearer: we take a piece of iron wire, form an oval with it by twisting the ends two or three turns, in such a manner that after being twisted, these two ends form a fork and the oval is nearly the third of the length of the bird's body; the two teeth of the fork must be pointed with a file, and near enough together to enter the rump; their ends will be hid under the great feathers of the tail, and the oval in the body of the bird; if the subject is of a large size, it will be necessary to tie the tail-bearer to the interior machinery, otherwise it may remain free.

All these wires being placed, and on a layer of chopped flax, we continue to anoint right and left, and especially at the rump; and in proportion as the preservative is placed, we furnish the part with chopped flax until the bird has attained its proper size. We then unite the skin by sewing it as we

have before said, separating the feathers at each stitch: we refurnish the orbits with chopped cotton, which we introduce with small forceps, rounding the eyelids well; we then place the eyes, introducing them under the eyelids, and when a part of the nictitating membrane appears below, we must push it in with the point of the needle, that the eye may remain in its place. It is necessary, before fixing it, to put a little gum on the cotton which is in the orbit.

In the middle of a small plank or piece of square wood, we fix an upright, crossed by another piece forming a crutch, we pierce the latter with two holes at the distance which exists between the feet of the bird, passing into them the two ends of wire which come out under the feet, and which have been kept long enough to turn them on this cross stick, to steady the bird.

Thus we have terminated all the mechanical operations, which now give place to the taste and ideas which spring from a knowledge of the manners and habits of birds; in short, to give to each species its peculiar attitude. Long and constant observations, assisted by practice, will do more for the naturalist than we can write on the subject.

It will now suffice to observe, that the bird being on its wooden support, we must press our two thumbs on the legs or tarsi, to incline the bird back-

wards; then bend the tibia to bring the body forward: before this operation, the tibia and tarsus were in a straight line; they now form the natural angle as in the leg of the bird, plate 2. When it is well placed we bend or turn the head according to the attitude we wish to give the bird, and afterwards arrange the wings. It only remains to smooth the feathers into their natural position, and, to keep them in place, we encircle the bird with small fillets of gauze or muslin, fastened with a pin. When the bird is quite dry, we take away the fillets, cut the wire of the head as close as possible to the skull, place it on a new foot of turned wood, proportioned to its size, write the name of the genus and the species on a ticket of white card, and fix it on the upright of the foot with a little gum.

The frame-work we have just described is the most simple, and is principally for small birds. We will now mention another, which answers for the smallest as well as the largest birds, and which we adopt in preference. It is, also, composed of four pieces. The first or centre ought to be nearly twice the length of the bird, we bend it at a third of its length in the form of an oval, twist it two turns, then pass the shortest end into the oval, and raise it against the longer end, so as to form a ring at the end or beyond the oval, big enough to receive the two wires from the claws; we twist it a

second time, uniting it strongly to the long end, which is straight and pointed, then rubbing it with oil we enter it into the neck, already stuffed with chopped flax; the oval of the iron ought to be in the middle of the body. The wires of the claws must, like the others, be straight and pointed; we also pass them through the soles of the feet; when the point is in, we curve it at the other end, to be the better able to work it up with the hand; and when the point appears within, we draw it up with the flat pincers after straightening the other end. To fix the irons of the claws to the middle branch, we pass the two inner ends into the little ring above the oval; we twist them together, and curve them within; we then fasten them with a thread or packthread to each side of the oval.

The tail-bearer is entirely similar to that of which we have before spoken, and we fix it in the same manner, thrusting the fork into the rump, and either leaving the oval free, or tied under that of the middle wire. This machinery, although different to the other, is always introduced after the neck and back are stuffed.

This method of passing the central wire through the neck after it is stuffed, is preferable to all others, not only because it is easier, but because it preserves the neck in its cylindrical form: we even stuff the neck of a swan before we introduce the wire.

Those employed in the zoological laboratory at the Museum, when they first arrived, were accustomed to put the wire in before they stuffed the neck, but they have all renounced this method, and prefer that we have just described. More than 2000 birds, in the number of those which now ornament the galleries of the Museum, have been mounted in this way.

Besides these two methods, Maugè had a third, peculiar to himself. When he had a wire of a size proportioned to the bird he was going to mount, he took two pieces of it, the one a little longer than the other; he pointed both ends of the longest piece, and one only of the shortest. We suppose the bird to be a small one. He held one end of each wire under the left thumb and fore-finger; at about the distance of two-thirds of an inch, he twisted the other parts five or six times with the same fingers of the right hand; after which he left a space untwisted large enough for a finger to pass through; he continued to twist it four or five turns, leaving a second interval untwisted, for the passage of the two wires of the claws, and giving the form of a triangle to the first space which he had reserved; it is obvious that the smaller opening or second distance ought to be one turn above the triangle.

The two wires for the claws are, as usual, straight and pointed at one end. To fix the centre wire,

when the head and neck were stuffed, he introduced the long end through the neck and skull; the fork at the other extremity passed across the rump to support the tail; one of the leg-wires being then passed up, he brought the end through the little hole which was above the triangle, he bent it along the opposite part, and united the two parts by tying them with thread; he did the same for the other leg. Maugè constantly employed this method for small birds, but he formed ovals for the larger ones.

After having spoken of these different methods of forming the inside frame-work for birds, one more remains to be described; that which we adopt when it is necessary to mount a bird with its wings extended. When the centre wire is placed, we thrust pointed wires across the wings the length of the "fouet" * of the fore-arms and arms; the ends which remain in the body are formed into ovals, the same size as that of the centre. If the birds we mount are of the size of a kite or a magpie, the thighs ought to be furnished in a peculiar manner, which we will describe.

The wire being passed along the leg, we draw part of it out, so that the bone is discovered; we then

* The French Ornithologists call that part of the bone of the wing which answers to the carpus and metacarpus, — the "fouet." (See *f*, Plate II.)

take unchopped flax and envelope the bone of the leg and the wire with it, always winding it and increasing it towards the top, until the thigh has attained the size which it had when covered with flesh; we put a little thread round the flax to prevent it from slipping. We then put the preservative on the skin and the factitious leg: and on putting it back in its place we take care that the surrounding feathers do not touch the preservative. The leg-wires are united to that of the middle, and to the wings, to which we tie them with packthread.

The wings of large birds are so fleshy, that the preservative put in the body cannot reach them even when they are placed in a state of repose, and the worms quickly attack them, if we do not take the precaution of opening them underneath. After having taken away the feathers to extract all the muscles or tendons with dentated pincers or a pair of scissars, we furnish this part well with the preservative, and cotton coarsely chopped, closing the opening by sewing it with thread. The first joint or bone of the arm should be entirely cleaned when skinning the bird.

The fork of the tail-bearer must be much longer for a large-tailed bird, such as the kite; we bend the two extremities of the fork horizontally, that it may better support the tail; we must also put preservative above and below the rump, raising the

feathers. We put oil of petrolium on the tarsi and the claws, to drive away the insects. A bird mounted with all these precautions preserves for a length of time, and we can make it take the attitude which we desire. If the wings are tied within at the proper distance, notwithstanding the wires which cross them, we can rest them against the body, and they will bend only at their natural articulations. If, on the contrary, we would give the attitude of seizing on the prey, we must make the legs almost stretched, the claws open, the head and neck bent down, the wings very much raised, about three quarters open and convex above, the tail forming a fan, almost perpendicular, and the body inclined towards the prey.

If we wish to make our bird flying, we extend its wings as much as possible; the tail will be horizontal and open, the neck forward and a little on one side; the claws shut, and the feet pressed against the breast. We suspend it thus to the ceiling, by a piece of string passed across its back.

If we prefer the moment of fright, the cross part of the support, or rather the perch, must be made obliquely; the left foot must be extended, the right on the contrary must be very near the body and bent; the body thrown to the right, the wing of that side elevated and very much spread, the other

less so and lower; the tail lowered, open and roofed, that is, sloped on each side; the neck raised and inclined to the right, the head leaning down, the beak open, the eyes fixed on the object of its fear. This description may be applied to all birds of prey, and an infinity of others; but it is not universally applicable.

We will now enter into some details on particular preparations for certain birds.

The first which presents itself is the *king of vultures*, (*vultur papa.*) This species is distinguished by the wrinkles of the naked part of the head, and by a large caroncule or piece of flesh on the base of the beak; the skin of these parts is red and bright blue, and the skin of the neck of a beautiful orange colour. All these colours disappear on the death of the bird. When it is mounted and very dry, we restore them, first preparing these tints, ground in oil, on a pallet, and then applying them to the bird with a brush previously dipped in spirits of turpentine. As this vulture is only found in America, we ought to advise travellers, that, independent of the usual preparations, we form a longitudinal incision behind the tarsus of this species, and some others, in which it is very strong and muscular: we extract all the tendons, and put some cotton and preservative in their place; without this precaution, the putrefaction of the fleshy

parts would destroy the tarsi, and make the scales fall off: it is not necessary to sew up the opening; we only bring the parts together.

Owls.

Nocturnal birds may be killed flying in the evening; by day we find them asleep in steeples, granaries, old towers, &c. We often see the *Great* and *Small Duke*, and other species, on the large branches of leafy trees, in the hollows of the trunks, at the bottom of small caverns formed by steep rocks.

When we skin birds of this genus, we must take many precautions to pass the head into the neck. It is generally very large, and we assist it by forcing off the skin with the thumb nails. The suitable attitude for this genus is upright, the neck very short, the beak touching the neck, the legs stretched, and the exterior finger directed outwards.

Birds of Paradise.

See the paragraph on the manner of mounting birds feather by feather.

Climbing Birds (*Grimpeurs of Cuvier.*)

Amongst the Passeres there are some birds which climb trees, along the trunks and

branches, to seek the insects which secrete themselves in the bark, which form their nourishment; nevertheless, the name of *Climbers* has been given to other birds, which seem peculiarly formed for that purpose, and whose exterior finger is turned behind, the same as the thumb; and thus, having two fingers before and two behind, they can easily sustain themselves in the awkward positions which they are frequently obliged to assume. We must, therefore, give the *pici* an attitude agreeing with their habits. The wooden support should be a plateau, surmounted by a stem proportioned to the size of the bird. The tail of the *pici* must always touch the upright at its extremity: we may vary the position of the other parts at pleasure.

Although the *cuckoos*, the *trogons*, the *bucco*s, the *toucans*, and *parrots*, are placed amongst the Climbers, they do not often climb: and it is only from the disposition of their fingers, that they are admitted into this family; consequently, the supports will have the form of a crutch, and these birds will be placed across it in the attitude which is preferred.

Of Gallinaceæ.

In the beautiful and numerous family of *Gallinaceæ*, we find some with fleshy parts, naked of feathers, and highly coloured, adhering to their

necks and heads; such as the *cock*, the *guinea fowl*, the *turkey*, and others. We must colour them as we have before described for the *vulture*. It would certainly be more advantageous to replace these parts with coloured wax, but this kind of work requires a hand well skilled in modelling.

The Ostrich.

The *Ostrich* inhabits the hottest countries of Africa, and attains the height of ten feet. Very strong wires are required to sustain this animal upright; their diameter will not allow them to twist very easily. We must, therefore, have a different frame-work, than for birds of a less size.

We take a bar of wood eighteen inches long, and from three to four inches in circumference; pierce a hole eight inches from one of the ends, then form a groove or cavity from the hole, as far as the extremity of the shortest end of the wood, above and below: at the other end we pierce two holes, the one four inches from the end, the other six inches. We enter the wire which is to sustain the head of the *ostrich* into the hole which is by itself. This wire must pass through to the other side, projecting eight inches, which is the length of the end from the hole; we curve the two ends

of the wire into the furrows made for their reception; we keep them in their place by means of strong wire nails, put in obliquely, so that the heads of the nails cross above the wires; we can make them still more solid by binding them down with a strong iron wire. The long end of wire which remains, must at least be the length of the neck, head, and beak of the bird. In this case the wire may be passed into the neck of the bird before the chopped flax is introduced, because, being very thick, it might find some difficulty in its passage through the middle of the flax. The wire being placed, and the neck stuffed, as well as a part of the back, the wood ought to be put in the middle of the body, to supply the place of the oval in other birds. When one of the wires has been passed through the leg, we make it enter about six inches into one of the holes in the wood, and curve it the length of the hinder part of the wood, fixing it there with two nails. We do the same with the other, and tie the whole together with a cord, independent of the nails. The rest of the operation is the same as for other birds. We place the ostrich on a stand or flat support, and all birds which do not perch ought to be mounted in this manner.

It is difficult to preserve an ostrich, by making use of the arsenical soap only. The feathers being

very long and thick, we must soak them with turpentine at their roots, and place little bags of camphire at intervals; if this substance does not always kill the insects, it will at least disperse them.

Shore Birds, (Grallæ, Lin.)

The screamer (*palamedea*), the jabiru (*mycteria*), and the pelican (*onocrotalus*), are amongst those birds whose tarsi must be opened, to take away the tendons, as we have before mentioned for the *king of the vultures*.

Flamingo, Phœnicopterus.

This singular bird inhabits all temperate climates, and is amongst those whose heads we cannot pass within the neck, when skinning them. When we meet with obstacles of this nature, we bare the neck as high as possible, by disengaging or pushing up the skin towards the back of the head, then cut off the neck and draw the skin straight again; and to enable us to take away the remainder of the vertebræ and the brain, we make an incision behind the head, turning back the skin right and left, we expose the first cervical vertebra, which we cut; we enlarge the occipital hole, to facilitate the taking away of the brain, and remove the eyes by the same opening. All this being done, we sew the skin with

very close stitches, taking care to scatter the feathers at each stitch.

When we mount this bird, we place the centre wire before we stuff the neck. We pierce the end of the bone of the tarsus, near the talon, with a bodkin, and introduce the point of the wire into this hole, and turning it round and round, we push it up as far as the knee; here we must have patience, and turn it right and left, without forcing it too much, until we have pierced the apophysis of the tarsus; this difficulty conquered, the wire will run easily, taking the place of the marrow of the bones. The feet of the *phœnicopterus* are palmated; when it is mounted, we must take care to spread the toes, that the membranes may appear; we fix them on the stand with very small nails or pins, and do the same by all birds with palmated feet.

The greater number of *ducks* having a large head, and consequently unable to pass the neck, which is often very slender, we make an incision like that of the *phœnicopterus*, in the nape of the neck. When ducks are mounted, they ought to have the body almost horizontal, and the neck in the form of an S.

Guilemots, Uriæ. Puffins, Fraterculæ. Penguins, Aptenodytes.

These birds ought to have the neck, body, and feet almost perpendicular. We must be very careful in skinning them; for their skin is very often furnished with a layer of fat or grease, which easily spreads; and to prevent the feathers from becoming dirty, we employ a great deal of cotton and flax, to protect the skin as we take it off.

Zealous travellers, who would be useful to the science of natural history, will find that we have described methods applicable to all animals. We hope they will attend to our instructions in the paragraph on the chace. They ought never to mount a bird during their journey; they must content themselves with the mere skinning, imbuing the skins with the preservative, stuffing them, and sewing up the opening; they must not forget to apply the spirits of turpentine, or oil of petrolium, and to envelope them in paper, that the feathers may not be soiled.

It now remains for us to speak of the method of mounting dried birds, which have been sent to us from foreign countries. The greater part of the proceedings are the same as those already described for mounting fresh birds. The wires are formed

and introduced in the same manner; but there are some preliminary operations for unstuffing the bird, and for softening the skin and feet.

We will suppose the bird to be of the size of a *blackbird*; we scatter the feathers of the belly right and left to discover the seam, which we rip, cutting each stitch; we entirely empty the body with our forceps; and by the help of an iron wire, curved at the end, we unstuff the neck, turning the wire slightly always the same way, and disengaging it from time to time. The bird being entirely empty, we place small balls of wet cotton in the eyes, wrap the feet in wet linen, and leave it in this state until the next day. However, as the linen and cotton would dry during the night, we cover the bird with a cloth which is *damped* only: the next morning we fill the neck and body with wet linen, and three or four hours after the bird will be fit to mount.

This precaution being taken, we begin by placing the eyes in the same manner as in a fresh bird; we stuff the neck, then a part of the body, and place the irons. Those of the legs are most difficult to pass through, and require more time and care, according to the state of preservation in these parts. The bird being placed on its temporary support, it is necessary to adjust the wings, which is often impossible; especially for the birds sent us from Guyana, from the attempts of the Indians to

prepare them. In this case we are obliged to cut them very close to the body; we separate the scapulary feathers, and soften them to give them the desired form; we put them back into their respective places, and keep them there by wrapping them round with several small bands of sheet lead. When they are very dry we paste them in their places with cotton dipped in gum and preservative, as well as the scapulary feathers; we then encircle the bird with small bands of fine linen, and leave it in this state until it be perfectly dry.

If, during the operation, some of the feathers fall off, we carefully preserve them. When the bird is quite dry, we take away the bands of linen and arrange the feathers in their proper order; if we find any which have taken a wrong direction, we pull them out, and again paste them in, doing the same with those which have fallen out. For this it will be sufficient to take the feather with the nippers and put some gum on with the point of a long pin, and with a needle, which we hold in our left hand, we raise the feathers in the place where we are going to fix the loose ones.

Of Birds mounted Feather by Feather.

We often receive birds from distant countries in such a state of decay, that it is impossible for us to

take advantage of them by any of the methods we have previously described: however, when the birds are interesting for science, or wanting in our collections, it would be mortifying to lose them. The only part which remains to be taken, is to make the bird feather by feather, in the following manner.

We choose a piece of twice-burnt iron wire*, of a length proportioned to that of the bird; we make an oval at one end, and roll some flax over the wire, giving it the form of an oblong silk or fringe bobbin, or rather imitating the size and form of the body of the bird we wish to re-make; we must, from time to time put some flour paste on the flax. The oval ought to be hid in the middle of the flax, and the piece of wire destined for the head ought to pass through one of the ends of this false body. To form the neck, we turn some flax round the iron. Having attained the proper size, we raise the neck from the breast, narrow the back towards the middle, in short, give the false body the form of a bird in feather. All this is done without difficulty by pressing the flax, whilst it is damp with the paste; and when we are contented with the form of our false body, we dry it by the fire, or in the sun.

* The wire which we buy with the polish on, is not sufficiently pliant, but snaps in bending; we make it thoroughly hot in the fire, and on its cooling we find it has become perfectly elastic.

During this time we soften the head, wings, tail, and claws, by the usual methods. This done, we fix the eyes, and put some leaden plates on the wings and tail to restore them to their natural form; we pass the wires through the legs, and leave them in the body with long ends. When all the members have taken their form, we fit them on the false body, paying attention to the length of the wings in comparison with the tail, in order to preserve exactly the same length in the factitious object. If, after having tried all these parts, the body appears too large in certain places, we diminish it with a very sharp instrument; if, on the contrary, it appears too small, we increase it with gummed cotton; we then pass the wire, which proceeds from the thighs, through the false body; being well placed in their right position, we unite them by twisting the two ends together which pass over the back, and we cut off what is too long; we fix the claws on a cross-bar of wood, pierced with a hole in the middle, to fix in the upright of the temporary foot. The bird thus placed, we form a hole at the end of the rump, and introduce the tail, furnished all round with gummed cotton to keep it fast.

When we are obliged to paste on the feathers one after the other, the cross-bar, on which the feet are fixed, should be separated from the upright, and stuck into that of a machine which is difficult to

describe, otherwise than by comparing it, when it is least complicated, to a wooden candlestick, the foot of which is very heavy, and the stem very strong. Several holes should be bored in this stem, one of which, five or six inches from the base, ought to have a third of an inch in diameter, and be entirely and horizontally across the stem; the others, of the same size, should be placed obliquely all round the stem, either above or below the first. The ends of the cross-bar on which the bird is fixed should be five inches longer than the bird on each side, and smaller than in the centre, to be able to thrust them firmly into the holes of this candlestick, that the bird may not shake whilst we place the feathers upon it. Being fixed to the new foot, the belly of the bird must be upwards; we then take a little melted gum arabic, an equal quantity of the preservative, and a little hair-powder, with which we make an amalgam for pasting the feathers; we put this paste on the belly, and begin by fixing the feathers which cover the tail underneath, then the feathers on the belly, always advancing towards the breast, observing not to lay them too thick, lest there might not be enough to finish it. We must especially, take the precaution of putting the feathers on the places they ought to occupy on the living bird, each on its proper side, because the beards of the left feathers are directed in a contrary sense to those of the right, also to observe the

shades and dispositions of the colours in the natural bird, and to use them advantageously in the factitious one. We must be careful not to place more than one feather at a time, and to cut the quills of all, to allow the paste to insinuate itself. After having done all this, we give the bird its natural position; placing the back upwards, we put the gum on the rump, and paste the feathers which cover this part. Before we paste the dorsal feathers, we fasten the wings, by placing a little gummed cotton in the place they are to occupy, and to make them hold we put in some pins through the beards of the feathers, which will hide the heads. The wings once fastened, we paste on the scapulary feathers in the same manner, and then all those of the back. The head will be pierced by the wire of the neck; we pull it down to a proper distance, and fix it by introducing gummed cotton into the skull and round the neck, which will be made larger than in nature, as it will shrink in drying, and is to receive the shortest and least downy feathers; we continue to paste the rest of the feathers until they mingle with those of the head.

We agree that it is almost impossible to succeed perfectly in the first trial; but if practice and experience are necessary in other things, they are particularly so for this part of taxidermy. Nevertheless, for the sake of aptness and correctness in the execution, we advise a sort of apprenticeship, by get-

ting two birds of the same species, one of which having been mounted by the usual method, will serve as a model for the form of the body, and the disposition of the feathers. When the skin of the other has been taken off and dried, it should be torn in pieces, and all the feathers confounded with each other and carefully collected in a little box, that none may be lost; and when the shape is formed, we paste them according to the above instructions, taking care to consult the model.

OF OVIPAROUS QUADRUPEDS.

Tortoises.

We separate the shell of the back from the breast work *, with a very strong short knife; and if the force of the hand be insufficient, we strike it with a mallet. When the turtle is open, we take away all the flesh which adheres to the breast or piece underneath, and also from all parts of the upper shell; we skin the head, the four feet, and the tail, as we do those of quadrupeds, but we must be careful to leave them adhering to the upper shell: we pass wires across all the members, imbue them slightly with the preservative, and stuff them with chopped flax. We then imbue the upper

* Linnæus calls the former *scutum* and the latter *sternum*: the French *carapace* and *plastron*.

shell with the preservative, sew the parts which require it, and with an awl make four little holes on the edges of the upper shell and breast, uniting them by these means. It often happens that the calipash of these animals is soiled or dirty; we clean it by rubbing it with a little nitric acid in water; and to make it shine, we rub it with a piece of cloth dipped in a little oil.

Lizards.

We skin and mount lizards as we do quadrupeds; but we must apply much less of the preservative to them, and we must also use much precaution in taking off the skin of the tail, which easily breaks. The small species lose their colours in preparation: we must content ourselves with putting them into spirituous liquor, in which they will preserve perfectly.

Frogs.

When we wish to mount one of these animals, we must open its mouth, cut the first cervical vertebra, and continue to take out the interior of the mouth with the scissars, we then raise up the two jaws, and pushing back the skin with the fingers of the right hand, and drawing the body in the contrary direction with the other hand, we easily remove the skin, making the body come out at the

mouth. We then put the feet back into their place, and do not use any preservative. We fill it with very fine sand, by means of a small funnel, which we pass into the mouth, leaving the two jaws resting against it. We pour the sand into the funnel, and direct its tube so that the body and feet of the animal may be perfectly filled. When the frog is quite full, we place it on a small piece of board, shut its mouth, give it the attitude peculiar to its species; and some days afterwards, when it is quite dry, we give it a coat of varnish. The varnish being hard, we bore some small holes under the belly, through which the sand easily escapes, and leaves the body empty, preserving its form.

Frogs lose their colour in drying, and I do not know any method of preserving them, unless it be by putting them into spirits of wine, like small lizards; these in their turn may be prepared with sand, but they become brown like frogs. We succeed much better with toads; their skin, already brown and rough, preserves its colour. The small species are better in spirits.

Serpents.

In some collections we see a great number of the large adders of Guyana, but the head is always wanting; thus these skins are worth very little to naturalists, and the trouble which travellers give

themselves to bring them over to Europe, is entirely thrown away as regards science. It is scarcely possible to skin these large species unless we first make an opening, and we recommend this opening to be made on the side, beginning from the termination of the scales, and not crossing or dividing them according to the usual method. The reason which leads us to this observation is, that these animals are classed and their species recognised by the number of their scales, and it is less easy to determine them if these are destroyed in skinning. We ought to preserve the head; for this part is as essential for natural history as it is for taxidermy.

Once taken off, the skin can be rolled up for the convenience of transportation; the small species may be put in spirits.* To mount them, we take an iron wire the length of the animal, we twist unchopped flax round it until it has attained the natural size; the skin being softened in the usual way, we extend it on a large table, place the factitious serpent in the middle, sew the skin up the whole lenth, and put in the eyes. The iron in the middle allows us to twist the animal at pleasure; when it is dry we give it a coat of varnish.

Every one knows, that in warm countries we find a great number of venomous serpents, the bite of which sometimes causes death in ten minutes; such

* For the strength of the spirit, &c. see p. 134.

as rattle-snakes, and many others; we ought therefore to hunt these animals with caution, and it is even better to leave it entirely to the natives of the country, who are accustomed to distinguish those that are venomous from those that are not, and are better skilled in killing both kinds. It is well to be careful of those serpents whose head is large and flat, and the neck narrow, for this character only belongs to those whose bite is venomous.

FISH.

Lampreys and Eels.

THESE may be skinned by the mouth, and be filled with fine sand, as we have pointed out for the frogs; the smaller ones must be put into spirits of wine.

Sharks.

Fish of this kind preserve their form and colour best when mounted, as they have a very thick skin, which is rough to the touch.

We make an incision from below the head to the fin of the tail; we take away the skin on each side with a sharp instrument, until we can cut the vertebral column as near as possible to the head: we proceed to skin the tail; we push the head within, and pass the skin above, for the greater facility in

taking away the cartilages which are in the inside of the head. We must take care not to enlarge the openings of the branchiæ; if we do, we must sew them up again, and it is not easy to hide a seam in the skin of a fish. We sometimes, however, repair the defects of mounted fish by employing putty; and, when it is dry, we paint it the proper colour in oil.

The sharks are generally of a large size, and for that reason we put a stick in the middle of the body, after having anointed and half-stuffed it. This piece of wood must enter a little into the head, to support it. If we intend hanging this fish to the ceiling, we put some pieces of iron wire at a little distance, fastened to the stick; these wires will pass across the stomach, and will serve to suspend the animal. This done, we continue to anoint it, stuff it, and sew it; it will be necessary to introduce the flax by the eyes and mouth to furnish the head; we then place the eyes; and as the semi-transparent cartilages are in many fish intimately connected with the eyes, we represent them after the animal is dry, with gum-arabic, in which we have put a little powdered starch.* Sharks do not require any varnish.

What we have just said of fish of this kind, is applicable to a variety of genera. When they are mounted, we put several coats of spirits of turpen-

* That is, we represent the *cornea* of the eye with this.

tine on every part of the head and fins; the latter are extended with an iron wire to keep them in that position.

Balistes, &c.

The *spatulariæ* have a very prominent muzzle, the body compressed, the belly and back sharp. They are generally found in the Indian seas.

We must open them by the belly, take away all the flesh by this opening, and stuff them as usual, taking great care to preserve the fins.

The *ostracion* is prepared in the same way. The body of this fish is enveloped by one scale of a single piece, and often very rude, the tail only is free and flexible. It is not necessary to make a very large opening in the belly. We must keep the piece we take out in making the opening, to replace it when the fish is mounted; we make an incision in the tail to take away all its flesh, and we stuff this part with chopped flax.

The *diodons*, or *spiny globe-fish*, do not require any other preparations than those mentioned above; they are armed with numerous long spines, which we must preserve; we apply the spirits of turpentine to the exterior. These fish ought to be packed with the greatest care, on account of their spines.

The rough skin of the fish vulgarly called *sea-toads*, *lophius*, may be mounted with much advantage, for the colours alter but little. It is not

necessary to varnish them. We find them in the Mediterranean.

Salmon, *carp*, *pike*, *trout*, *tench*, *perch*, &c. are easily mounted; the scales which cover them always tarnish a little in drying, but we partly remedy this inconvenience by varnishing them before they are quite dry. After some time the varnish will rise in little scales, we then take a little nitric acid, which we mix with much water, and completely take off all the varnish which covered the fish, by rubbing it with a little brush. An hour after, we varnish it afresh, and this coat will not scale off.

We have spoken of almost all the fish which require peculiar proceedings for mounting and preparing them. We agree with Mr. Manduyt, that it is impossible to preserve fish with all their brilliancy of colour, as we may the greater number of birds, insects, &c. Spirituous liquors are still preferable to all preparations, but the size of many fish does not admit of this method. We recommend to travellers to put as many fish as they can into spirits, and we will now point out the precautions to be used for their transportation.

In long voyages we must furnish ourselves with small casks, holding from four to eight gallons, and bound with iron. Near the bung-hole we cut an aperture about six inches by four in this shape ⊍, so that the piece cut out, which is used to stop or close it, cannot possibly fall into the cask. We fill about

two-thirds of one of these little barrels with spirits. We take notes of the fish to be preserved: where it was caught; whether male or female; if good or bad to eat; if salted in the country, &c. This done, we wrap the fish in a piece of linen, and sew it; we then attach a little plate of wood, on which we have engraved the number corresponding to our note with a sharp knife; we then put the fish into the cask, which we close hermetically, that the spirit may not evaporate.

If, as it sometimes happens, the fish we preserve has the belly very much swollen by spawn, we make an incision in the anus, which we prolong to the anterior part of the belly, to extract the eggs, which if not taken away would soon suck up the liquor. As we deposit a bed of fish, we put a bed of cotton or new flax, to prevent the rubbing and tossing about in the conveyance; in general the vessel ought not to contain more than two-thirds of fish, the rest ought to be flax or cotton and spirits.

Mollusca.

The greater number of these animals live in shells (testæ), and particularly bear the name of testacea; we also include with them those which, like slugs, are entirely naked, and give them the general name of Mollusca.

Slugs, cuttle-fish, dorides, &c. can only be preserved in spirits; it is the same with animals which inhabit shells, but we ought to preserve the shell.

The greater part of these animals dwell in the sea, others in fresh water, and many are found on land, in cool damp places, and almost always in the shade. We distinguish them from each other by the denominations of marine shells, (testæ marinæ), fluviatiles (river shells), and terrestres or land shells. These last are very much sought after, many of them fetch a great price amongst amateurs, because of their rarity. We must recommend to travellers, if it is only as a secondary consideration, to search particularly for terrestrial shells. When they have found them, they must place them in any sort of vessel, and pour boiling water on them; after a moment they can tear the animal from its shell with a pin, or the tooth of a fork; they may do the same by fresh-water and sea shells.

Marine shells, bivalves or univalves, are all covered by a species of coriaceous envelope (*drap marin*,) or other foreign substances. We take these off with nitric acid or aquafortis, with which we imbue them exteriorly with a horse-hair pencil, some seconds after we put them into a vessel full of soft water, then brush them; the asperities will discover themselves, and we again put nitric acid on those parts which do not appear to belong to the shell. When all the foreign substances are taken away, we

give them a lustre, by rubbing them strongly with powdered pumice-stone, diluted in a very little water; and, for the finishing, we rub them afresh, with a softer brush, and with tripoli or rotten stone reduced to a very fine powder.

There are some species from which we take away the calcareous matter, even to the mother-of-pearl. This operation frequently wastes the shell so much as to destroy the characters; this is prejudicial to science, although it is pleasing to the eye, and we ought not to permit it unless we possess several of the same species. This is the most tedious of all operations. To succeed, we must remove this calcareous matter with a file, and when we approach the extremity of the spire it requires great management. As it is very thin in this place, we must at each stroke of the file examine if we have not gone too deep; without this precaution we should make a hole in the shell, and the labour would be completely lost. If by patience we happen to expose or discover the mother-of-pearl entirely, we soften the file with a piece of buffalo skin, on which we put powdered pumice diluted with a little oil; we then take another piece of skin and tripoli, and afterwards give the last polish with very fine red ochre. However pleasing the results of this operation may be, the value of the shell is much diminished in the eye of a naturalist.

We can by the above method clean shells of all

forms. As to those with long spines, and other asperities, like spondyli, pectenes, &c., we put a thin layer of gum-arabic over them with a brush, to revive the colours.

Crustacea.

The animals of this family are perhaps the most singularly formed of all created beings. They present astonishing phenomena in their manners and habits.

Crabs and other crustacea are found in almost every sea; some of them quit this element to plunder the woods; we have even seen the land-crab, (*gecarcinus*) a league from the shore, and often on very high mountains; but when they wish to deposit their eggs they go to the sea.

When we have procured a *pagurus* or hermit-crab, we take it from the shell, make an incision in the tail, which is always very flabby, empty it by this opening, fill it with cotton, and then put the animal into its shell, and wrap it in paper. We entirely take away the flesh of lobsters, crabs, &c. of a certain size. We cut the branchiæ, as well as all the intestines; we put the preservative wherever we have taken away the flesh, cover the soap with a little cotton, and replace the shell of the back. The pincers which terminate the anterior claws are often very large, and consequently contain much flesh; in this

case we take away the smallest possible piece of the pincer, and extract all the flesh by this hole, and then replace this little piece. Large crustaceæ should be packed in middling-sized cases, between layers of cotton or flax, pressed in such a manner that they cannot rub in the carriage. The small-sized crustacea do not require to be emptied, but we must leave them for an hour or two in fresh water. We dry them and pack them as the large ones, after having wrapped them in paper, that a claw may not be lost if it happens to separate.

As to the very small ones, about the size of a three-shilling piece, after having put them in fresh water and dried them, we fix them on a large pin towards the posterior part of the shell of the back, and to transport them, we pin them strongly in a double box of cork, which we fill up with cotton or flax.

INSTRUCTIONS FOR PRESERVING AND TRANSPORTING INSECTS.

Asia, Africa, and South America, are the parts of the world which are richest in insects of the most beautiful kinds.

We will therefore suppose that we are provided for a voyage in one of these countries; for we must recollect that we require fewer things to collect those of Europe, being always within the reach of supplies.

We construct twenty-four thin wooden boxes 18 inches long, 15 wide, and 2 deep; the lid should be fastened to the box with hinges. We line the bottom of the inside with layers of cork, about the sixth of an inch thick. This cork should be fixed with very strong paste, and some wire nails, and we deposit the insects in these boxes, as we catch them.

Before we place the insects, we anoint these boxes within and without with oil of petroleum, or, for want of it, with an infusion of aromatic plants, as laurel, thyme, sage, aloes, rosemary, cinnamon, cloves; and, with strong pins we fasten a small packet of camphire wrapped in linen. When a box is full, we pitch over the whole outside to keep away living insects, and to preserve those within from sea-damp. We must be careful not to place large insects, such as we find in the genera *prionus*, *scarabeus*, &c., because their weight would necessarily separate them during their conveyance, and they would not fail to break the smaller ones, which are in the same box. We therefore place these large ones in bottles, the mouths of which have nearly an inch and a quarter in diameter. This vessel must be three quarters full of a spirituous liquor; rum or brandy: it should be closed with a good cork, and the traveller should take one of these bottles with him to receive all the large *coleopteræ* he meets with.

There is another sort of box made of pasteboard, which we call the hunting-box. It is 10 inches long, 4 wide, and 3 deep. It ought to be oval, like a shuttle, but round at each end, as this is the most convenient form for carrying in the pocket.

This species of game-bag serves to receive the insects caught during the day, and we must be careful to pin those of a middling size to the bottom, and the smaller ones to the lid. We paste two small round pieces of cork at the two extremities of the lid; they serve as a pin-cushion, and enable us to open the box with greater ease.

The rackets or butterfly nets ought to be ten inches in diameter; the two pieces of wire which terminate the racket should be fixed in a socket of iron or brass, like a stick. We run some lead nearly a third of the length of the socket, to fix in the ends of the racket, and at the other extremity of this socket, we put in a stick four feet long, which we fix by a nail across the socket and the stick. All around the iron wire which forms the racket, we sew a piece of gauze, which finishes in a rounded point, and which is from fifteen to eighteen inches long. This net serves for catching insects and butterflies on the ground, on flowers, and even in flight. We must observe, when we wish to catch a butterfly on a flower, that the instrument goes from right to left and horizontally; when the insect is in the net, we turn it in our

hand, so that the ring which carries the net is perpendicular; we take the pocket in the left hand, gently force the butterfly to the bottom of the pocket, then with the thumb and first finger of the right hand, we press the breast of the butterfly, that is, the place whence the wings proceed, taking care not to injure them. The butterfly will then fall half dead into our left hand; we pierce the thorax with a pin proportioned to its size, and pin it into the hunting box.

We will now describe a second net, like the first in form, only the iron is stronger, and the pocket, instead of being of fine, is made of coarse gauze. This net is for fishing in the small rivers and stagnant waters, which contain an infinity of insects of the greatest interest, and which the greater part of travelling naturalists have hitherto neglected, for want of the means of catching them. They are very simple; they consist in dipping the net to the bottom of the water, even into the mud; we then move it from side to side, to wash away the dirt which it contains, observing that the pocket must always be in an opposite direction to that in which we strike the net.

We then take the insects, one after the other, stick them by the wing cases (*elytra*), in such a manner that the pin passes underneath, between the first pair of feet and the intermediate ones. We ought to pin all *coleoptera* in this way. Dragon-

flies, flies, bees, grasshoppers, bugs, &c. are pinned through the thorax, in the same way as butterflies.

In long voyages we should scarcely have time to give insects their living attitude. We generally reserve this work for our return. We then restore them to their suppleness, by pinning a part of them on a round of cork, the size of the bottom of a plate, which we place in a large vessel; we then pour a little cold water until the cork swims, when we cover it.

The humidity will soften these insects the same day or the day after they have been placed in the vessel.

In order to give the softened insect its natural attitude, we pin it on a small square piece of cork, and by the help of small forceps we bring back all the extremities to the place which they ought to occupy. We fix them temporarily with pins, and twenty-four hours afterwards, the insects having dried in this attitude, we take away all the pins, excepting that which goes through the body, and which serves to fasten them. Each extremity will retain the position given it by this operation.

To set butterflies, we must be provided with little planks of soft wood; a groove, deep enough to receive the body of the butterfly, should run across them; we pin the butterfly in the middle of the groove, so that the body be buried in it, up to the

insertion of the wings. Then, with very fine pins, we fix the wings in their natural position; after that, we place a piece of paper or card on the wings, which we fasten to the wood with two or three pins; and after the butterfly has remained one or two days in this position, we take away the card and pins, and lift it up; it will always preserve its legs and wings in the position we have wished them to take.

We find insects every where, on flowers, on the leaves of trees, plants, &c. We procure those which escape the eye by the following proceeding. We spread a table cloth or large piece of white linen, under a bush, or under the branches of the trees, and beat the branches with a great stick, for the insects, and the caterpillars to fall on the cloth; we stick them and place them in the boxes. We may supply the place of the cloth by an umbrella, which we hold reversed with the left hand, whilst we strike the branches with the right. This was the method of the naturalist Bosc.

The *scarabæidæ* are found in rotten wood, in old stumps, under stones, &c. Those of the genus copris, so beautiful and numerous, are most commonly found in the dung of ruminating and other animals. The traveller should search for them, however disagreeable, for he will be recompensed by their great beauty.

The nature of spiders does not allow us to pre-

serve them like insects. Their flabby abdomen changes in drying, as well as their colours, and we are obliged to put them into spirits. There are some species, however, which preserve tolerably well, such as the bird-catcher (*mygale*,) and others: the very small ones may be pricked like insects, but they generally lose their colours when they die. We must seek them under bushes, in the caves of rocks, in deserted houses, or those which are seldom inhabited, in gloomy places, under stones, under rotten trees. There is a species in France which is found in the water; some exotic species have a very dangerous bite.

It is not so easy to procure nocturnal butterflies (known to naturalists by the generic names of phalæna, bombyx, noctua, &c.) as those which fly by day. The latter fly from flower to flower in the heat of the sun; we find them in all situations, some (the *pontiæ*) frequent gardens, and all cultivated places, or their neighbourhoods; others prefer barren ground; others (of the genus of the *hipparchia*,) constantly remain in the forests. It is not the same with nocturnal butterflies: they never show themselves by day; some nourish themselves with flowers, like the common butterflies; others only seek each other to propagate their species, and the females deposit their eggs on the plant which is most suitable to generate them. This duty fulfilled, they exist but a few days, and the males soon

follow them. In India, the *phalænæ* prefer habitations; attracted by the light, they enter the casements, which are always open in the evening to admit the cool air of that hour. We catch them with a net in the usual way. In the morning, we find them asleep on the ceilings, and inside and outside walls of the houses. A skilful person can prick them against the wall, and has no occasion for a net. The means we have recommended, with respect to *nocturnal butterflies* and the *sphinges*, are very insufficient to procure us a numerous collection of species. We must, therefore, have recourse to rearing caterpillars.

To bring them home, we procure some boxes of pasteboard, from four to six inches in diameter; we must bore a hole in the lid to give them air, and a piece of clear gauze must be pasted over the hole, to prevent them from escaping. We put the caterpillars we have collected into one of these boxes, adding some leaves of the plant on which they feed; to carry these boxes more easily during our excursion, they should fit one into another. When we come home, we must place these caterpillars in much larger boxes, each species separately, with a handful of the foliage of the plant on which we found them. These branches ought to be placed in the middle of the box, and in a small vessel of water to keep them fresh; it is necessary that the branches touch the sides of the box, that

the caterpillars may climb from the bottom of them to their food. We change these branches every two or three days.

The caterpillars of the sphinx are found on plants, like those of other butterflies. They are distinguished by a sort of horn which they bear on the last ring of the upper part of their body; we nourish them in the usual way, but add a little earth to the bottom of the box; for the caterpillars of this genus make use of it to change into chrysalids. The rearing of caterpillars demands much care and attention; if we forget to give them, regularly, the proper quantity and kind of food, they die before they produce the butterflies which recompense us for our trouble. The gauze which is above the box, admits sufficient air for their existence, and allows the observer to study and admire these insects, either as they feed, or as they spin the silk which is to serve them as a tomb at the same time that it becomes the cradle of a new phœnix. Here ends the rearing of caterpillars. When they have attained their greatest size, they change into chrysalids (*pupæ*.) Some plunge into the earth, where some of the species pass the winter; we cannot preserve their chrysalids during this season, except by keeping the box containing the earth in which they are buried, exposed to the open air. Such is the caterpillar of the brier, (*bombyx rubi*, Fab.) Others spin a cod of silk round them. Some of

the day-butterflies suspend themselves by their posterior part. In this state of lethargy, these beings require no more assistance; their own substance suffices for their nourishment. At the period fixed by nature for each species, the insect emerges from its tomb, ornamented with the liveliest colours; and thus the proprietor will be recompensed for his trouble, by procuring the most recent specimens, which he could not otherwise have obtained.

Method of drying and preserving the Caterpillars or Larvæ of Insects.

M. Laurent is said to have been the first who discovered the method of preparing larvæ, preserving their forms, and, as much as possible, their colours. He has doubtless rendered a great service to entomology, by presenting in a single picture all the metamorphoses of the butterfly; the caterpillar at different ages, the chrysalid above and below, the eggs, and even the excrement, which has very singular forms; nothing is forgotten, even to the species of ichneumons, and flies, which attack the caterpillars and live at their expense.

There are several methods of preserving them: we will point out that which seems to us the most easy and requires the least apparatus.

We must provide ourselves with a chafing-dish or earthen furnace, and when the coal or

cinder in it is well lighted, we cover it with an iron plate, the edges of which are raised in the form of a dish. We pass a pin into the anus of the caterpillar, to make a passage for the intestines; we empty it, by pressing it with the thumb and fore-finger, beginning at the head and proceeding to the anus. When it is quite empty, we introduce into the anus a pipe of straw or grass, of a size proportioned to that of the caterpillar; we pass a small pin across the skin of the caterpillar at the last ring, so that the pin passes through the straw as well, and keeps it in its place. We then present the caterpillar to the top of the furnace, but not to its greatest heat, that the posterior part may attach itself, when drying, to the pipe; half a minute will suffice for this, which done, we blow through the pipe, and the caterpillar will immediately swell, and take its proper form: we continue to blow, turning round the pipe of straw all the time; and when we perceive that the caterpillar is dry and will remain in its natural form, we take out the pin and straw pipe. If either resist, we cut it close off.

Star-Fish. (*Asteriæ.*)

At low tides, we find a considerable quantity of marine animals, and particularly star-fish, either in the sand, or, more frequently, attached to large

stones and marine plants. Some beautiful species are found in the South Sea, which have very slender rays, and which are furnished on each side with an infinity of very fragile, crustaceous, tentaculæ, and consequently very difficult to preserve: to do this, it is necessary to soak them in fresh water for several hours; we then extend them on a plank of soft wood, and keep the rays in their respective position, by the help of pins, which we stick into the plank, along and at the sides of the rays.

When the animal has dried in this position, we wrap it very cautiously in two sheets of paper. All slight and fragile star-fish must be packed in small boxes, between layers of cotton and flax. We do the same by large ones, but put each of these into a separate case. The Medusa's heads undergo the same preparations as the common star-fish. We find a great quantity of animals almost entirely flabby, and which, from their nature, are not susceptible of any preparation, and the only method of preserving them, is by putting them into spirits. Such are worms, amphitrites, nereides, leeches, tæniæ, gordii, &c. &c.

Echini.

These extraordinary animals are all marine, and the greater number are very difficult to preserve

with their points in their natural direction. Those which we catch in the Indian seas, known by the name of cidaris, are much more difficult to preserve than others; the heavy and calcareous spines with which they are armed, fall from their own weight. The method of preventing this loss demands much precaution.

When we procure an echinus, and whilst it is still living, we enlarge the anus, and with a very small spoon or rather a large ear-picker, empty it entirely by this opening; we then soak it for ten minutes in fresh water, taking care to prevent the spines from coming off; after that, we introduce some cotton into the shell, until it is quite full. We must not put any preservative. We then lay the shell on a plank, and between each spine introduce a plug of cotton or paper, in such a manner that all may remain fixed, directing themselves from the centre to the circumference, and we let them dry in this position.

To transport them, we must pack each separately when they are large, always preserving the cotton between the spines, and filling up the box in such a manner, that none of them can rub on their way. All large echini may be prepared and packed in the same way; the small ones may be put several together into the same box. The greater part of the large echini lose their spines, as we have before said, and we rarely find one in our

collections perfectly preserved; we will now point out a method of refixing them, provided we have taken care to collect all the spines; and, indeed, the operation requires much address, and great dexterity of finger. All the places of the spines are indicated on the shell of the echinus by so many tubercles. We procure a small gimblet; and pierce a hole about a quarter of an inch deep, in that end of the spine which was attached to the shell. When these are bored, we introduce a needle into the hole, to fix which we add a little gum arabic or warm isinglass; the spines being thus prepared, we fill the shell of the echinus with melted bees-wax, taking care to stop all the openings, to prevent the warm wax from escaping at the moment we put it in. When it is well congealed, we make a hole in the middle of each tubercle, lay all the spines on the table, and determine the place of each on the shell; then taking one of the superior spines, we warm the needle which comes from it in the candle, and introduce it quite hot into the hole of the tubercle to which it belongs; the wax inside the shell having been melted by the introduction of the hot needle, soon congeals again, and retains the spine in its proper position; we do the same with all the rest, and the *echinus* resumes its natural appearance.

Zoophites.

These species of *polypes* live in families; the axis of their dwelling is a horny substance, generally blackish, hard, and disposed in layers. Their surface is almost always armed with little spines, covered by a gelatinous matter. The axis of the gorgons is also horny; the flesh which covers this axis contains detached particles, very friable in almost all the species. To preserve them, we put them for an hour, or two, at most, into fresh water, and dry them, holding the branches open. We proceed in the same way with sea-pens, *pennatulæ*.

The calcareous, brittle, and friable substance of the Madrepores, exacts infinitely more precaution in their packing than in their preservation; those of a middling size, and the smallest are put into proportionable boxes, which are pressed on all sides with moss: the enormous weight of the larger ones requires that they should be fixed to the bottom of the case which contains them, which we do by passing cords between their branches at the base, bringing them out at the ends by holes bored in the bottom; these ends must be fixed by nailing them outside. We sometimes find large openings in the feet of the madrepores, and we take advantage of them to fix the animal more solidly, by passing several sticks into the holes, and after-

wards nailing the ends of the sticks at the bottom. As madrepores are very solid, we fill up the remainder of the case with dried moss.

Sponges require no other care for their preservation than soaking them in fresh water, and drying them perfectly before we pack them. They form the last genus of the animal kingdom.

OF THE NESTS AND EGGS OF BIRDS.

BEFORE we conclude, we ought to say a few words on eggs and nests; objects as interesting to zoologists as the birds themselves. In the construction of their nests we must particularly admire the industry and care of birds for the propagation of their species. This part of Natural History, which offers a crowd of interesting facts, has not hitherto been properly studied, except by the Abbé Manesse: and I cannot help repeating the wish of all naturalists, that the manuscript to which he has committed so many observations and curious facts, on the manners of birds, may be given to the public. Since Buffon, no authors have treated on this subject, unless it be Wilson (in his beautiful work on the birds of North America), and Vieillot; whilst in all other respects, Natural History has made immense progress since the work of Linnæus. The Regne Animal of M. Cuvier, in four

volumes, is indispensable to all naturalists. We there find all beings classed according to their natural affinities, founded on comparative anatomy; but it did not enter into the plan of this author to speak of the manners of birds. We therefore think it useful to offer some hints for procuring and preserving eggs and nests.

Birds of Prey construct their nests in the holes of rocks, or on large trees. *Owls* and *Crows* place theirs in the holes of steeples, old towers, and in rocks; the *Pici* in hollow trees, or in the holes they have themselves made, and the openings of which we must enlarge to take away the eggs; the *Lanii* make their nests on trees, and sometimes lay their eggs in those of other species, which they seize by force; *Thrushes*, *Blackbirds*, &c. nest at a moderate height on fruit trees, in hedges, and often in the neighbourhood of houses; the numerous family of *Warblers* in warrens, bushes, briers, &c. The greater part of the *Gallinaceæ* make their nests on the ground, in cultivated fields; they form them with a little dry grass, which they put into a hole, and it would be too troublesome to remove them; we must content ourselves by carefully describing them, and taking the eggs. We must do thus by several birds' nests which are not sufficiently solid for them to be conveyed.

We know very little of the nests of exotic birds,

and we request travellers to collect all they can find. The Museum of Natural History in Paris possesses but very few specimens.

When we have discovered the nest, we must try to procure the male or female before we take it away, for it is very essential to be able to determine precisely the species which constructed it. In all cases we must enumerate the different objects which we have collected, and keep a journal of them, noting the place where we found them, the number of eggs, &c. The most minute details in Natural History are highly interesting. After having taken away the nest in a basket or box, we empty the eggs by forming a very small hole at each end, and blowing at one of these ends, the contents will escape at the other, unless the embryo is already formed, and we must then make a bigger hole in the centre of the egg, by which we take out the embryo with a small hook; we must then stop up the hole by pasting a piece of fine linen or glove-leather over it. The egg thus prepared, will not appear altered, the opening will even enable us to fix it more surely, either in the nest or pasting it on pasteboard, as may be seen in the Museum of Natural History in Paris.

To convey them, we must put a small layer of cotton at the bottom of the nest, then the eggs and another layer of cotton: we put the nest in a box proportioned to its size, and fill it up in such a

manner that the pressure of the lid may not be too great for the eggs. If we have several nests, we must have a box with several compartments. For long voyages, we must take the precaution of binding the cases with bands of cloth covered with pitch, or at least the joinings of the boards, to defend them from humidity.

Although Taxidermy requires some knowledge of Natural History, its operations are wholly mechanical.

METHOD OF MAKING ENAMEL EYES FOR ANIMALS.

As the eyes of all animals are the organs which best express their dispositions, they demand all the care of the naturalist.

The instruments necessary for their fabrication are, an enameller's table, bellows, lamp, round pincers, about six inches long (which close by means of a ring, and with which we hold the iron-wire forming the point of support,) and the base of those eyes which it would be impossible to blow; another flat pair of pincers the same length, which serve to handle the enamel when necessary and at the same time to stir up the lamp. All these instruments are to be bought ready made.

The materials are, an assortment of small cylinders of enamel of all colours, which may be

found in Paris, and still better at Nevers, where they are cheaper than elsewhere, and clippings or fragments of looking glasses, which we melt in the lamp, into a sort of small cylinder like the enamel, before we use them. We take care in melting these pieces of glass, to free them from all spots and globules of air. We can procure these glass cylinders ready made at some glass manufactories.

When furnished with every thing, we put the table in an obscure place, that the light from elsewhere may not destroy that of the lamp, which is alone sufficient to be able to operate with certainty. The lamp well lighted, we direct the pipe of the bellows towards the middle of the wick, which we scatter a little in that part, and procure a clear and blueish flame, to which we expose the enamel we wish to melt. If this flame be not clear and lively, the colours of the enamel are apt to change, and the operation fails. Practice alone teaches the proper degree of flame; but it is generally better to expose the enamel we wish to melt to the extremity of the jet of the flame, where it never burns, and frequently melts more easily than in the centre. Small eyes being the least difficult, we always begin to learn upon them. For these we take a small iron wire, an inch and a half in length, and hold one of the extremities in the round pincers, whilst we approach the other to the fire, to which we expose, at the same time, the enamel of the colour we

wish to make the eye, turning it between our fingers until it begins to melt; we then fasten the quantity necessary for the size of the eye we wish to make, to the end of the iron wire; it forms a little globe by turning it in the flame, and when it is well rounded, we place in the centre a little speck of black enamel, which is to form the pupil. We again expose it to the fire, that this pupil may be incorporated with the mass; and when it is well incrusted we put some glass upon it, which at least ought to extend over three quarters of the hemisphere; it is this glass which, by representing the vitreous humour of the eye, gives it all its brilliancy. We continue to expose the eye to the fire, until the glass has equally extended over that part of it which is to form the iris; and this being the case we let it cool slowly. We may make this sort of eye by joining several pieces of iron wire together: it is then easier to make them all the same size, because the first being always close to our eyes, guides us in making the rest.

The following is another method: — we prepare some pieces of iron wire, well burned, and three or four inches long, the strength of which must be proportioned to the size of the eye we are going to make. We curve these in the middle over a tube of glass enamel, or any other cylindrical and polished body; we unite the extremities of each wire by twisting one over the other, so that they exactly

fit the substance they embrace; this circle, formed by the wire, makes the diameter of the eye, and the wire thus prepared is like a racket; we fix the handle of this racket in the round pincers, and curve the head of it by making it parallel to that of the pincers. We then fill this circle with common enamel, of the colour we think proper, extending it from the circumference to the centre, and when there is a sufficient quantity, that is, nearly the thickness of the iron wire, we press it, whilst it is still in a state of fusion, with the flat pincers, that it may extend equally over the whole circumference. We again put it in the fire to consolidate it; after which we place the iris, which is a drop of enamel of the proper colour; we heat this and press it as before, with the flat pincers, and when it is incorporated with the first enamel, we make the pupil with a drop of black enamel in the centre. When it is melted and incrusted in the iris, we cover both with the glass, and heat them until all the parts are quite smooth, and the glass is equally spread over the whole iris. We place the eye on some warm cinders, and leave it to cool slowly, without which it is liable to break; we then take it from the wire, by loosening the latter. This method can only be used for eyes of middling size.

A third manner of making eyes, which is preferable to all others, is to blow them, if possible, which is not the case when they are small. For this we

use a pipe of baked earth, or a tube of glass, from six to seven inches long, to the end of which we put a little white enamel, which we present to the fire in order to blow it. This enamel forms a globe, larger or smaller according as it is dilated by the air we introduce. This globe being the proper size, we place in the middle, and perpendicularly to the point of the pipe, the quantity of enamel necessary to make the iris; we incorporate the second enamel with the first, by presenting it to the fire, and taking care always to turn the pipe with our fingers, that the enamel may spread equally and the iris be exactly round. If this iris is to be of several colours, as for example that of man, we distribute in diverging rays, several little threads of the suitable enamel; we present the eye to the fire until we have incorporated the iris, after which we place the pupil, heat it in the same way, and then apply the glass. As it is almost impossible that the eye should not sink down in the course of this operation, and that the air which we have introduced should not escape, as much by the heat as by the pressure which we use above, in applying the different substances; we must take care from time to time to introduce it afresh, that it may not lose its form. This is especially necessary when we apply the glass, and it is extended over the whole surface of the iris.

After having given the eye its size and form, we

take away the pipe; to do which, after the air has been introduced, we stop the entrance of the pipe with the finger, and expose the back part of the eye to the fire; when the air contained in the globe, and rarified by the pipe, comes through at the place where the fire has most action. We prolong this opening by turning the point of the flat pincers or an iron wire, all round the pipe, we leave but one point, by which the eye remains fixed; we warm it equally all over, after which we expose it to a gentle heat; and when it is cold again, we separate it from the pipe.

ADDITIONAL INSTRUCTIONS

FOR

TRAVELLERS.

THE preceding treatise having been written for the use of collectors, superintendants of museums, and artists, as well as travellers, I add the Instructions drawn up by the Professors of the Jardin du Roi, at Paris, expressly for the use of the latter, to whom they are gratuitously presented. I would request this class of readers to comprehend such parts of the previous treatise of M. Dufresne, as are given under the following titles:

1st, The manner of collecting and preparing objects of natural history.

2dly, The method of packing and enabling them to arrive at their place of destination in the best state possible.

3dly, The nature of the notes which ought to accompany these objects.

4thly, An indication of the objects which are most particularly desired.

ANIMAL KINGDOM.

THE study of zoology in the Museum of Natural History, does not limit itself to the observation of the forms of animals and the description of their organs; it also embraces the examination of their habits, their developement, their sagacity; and seeks if they can be of any utility. Formerly, we could only inform ourselves on these essential points by the relations of travellers. The establishments formed at a great expense by princes and rich amateurs, for assembling and taking care of rare animals, were rather objects of luxury or curiosity than of study. But, since a menagerie has been added to the Museum at Paris, a new career of observations has been opened to naturalists. We can there follow animals in all their stages, and compare their manner of life with the organization which anatomy discloses after their death; we require positive knowledge on the important phenomena of copulation, gestation, and birth; we learn to distinguish the varieties which proceed from age, from those which are produced by climate, nourishment, or mixture of races, and to determine with certainty the differences which really exist between the species. If these animals are of

a nature to be serviceable to domestic economy or to agriculture, we have the means of rearing and training them, and thus we add to our resources. The *Peruvian sheep*, the *lama*, the *kangaroo*, the *casoary*, may, perhaps, one day be very useful.

Considered in a scientific point of view, there are few animals foreign to Europe which are not useful to study. If we except the *elephant* of Asia, the *royal tiger*, and the *lion* of Africa, the history of all others is more or less incomplete. Even that of the *lion* was not well known, until the lioness of the Menagerie had young ones; it is also since two *elephants* have died in the same menagerie, that we have acquired an exact knowledge of the anatomy of this great quadruped. We cannot, then, too strongly recommend to travellers, who can procure living animals, to neglect nothing which can facilitate their arrival in Europe. The smaller quadrupeds, and principally those who dig the ground and hide themselves in burrows, are still less known.

We may easily procure animals by applying to the natives of the country, who know where to find them, and who have frequent opportunities of meeting with them in their excursions. They may take them in traps and bring them back alive. Nor is it difficult for them to take some of the

quadrupeds or birds in their infancy, with whose retreats or nests they may be acquainted.

The younger the animals are, the easier it is to accustom them to live in their cages. They will at first require particular care, and must always be nourished some weeks on shore, before they are embarked; we cannot take too much pains to tame them. An animal which is not frightened at the sight of those who attend him, is always better, and more able to resist the fatigues of a sea-voyage, than when he remains in a wild state; and there is scarcely any animal which we cannot soften by good treatment. An excess of nourishment when animals are shut up and not able to take exercise is very injurious to them. The surest method of preserving them, is to give them strictly what is necessary. After the proportionate nourishment, the greatest requisite is cleanliness. We may always find some person on board the vessel, who will attend to them for a slight recompense. It is also very necessary to take precautions that these animals may not be worried and irritated by passengers.

We must content ourselves by bringing the skin, head, and feet of the large animals we have killed in too distant a place to transport them entire.

The Mammalia, sufficiently small to be enclosed in a bottle or barrel, ought to be put into spirituous liquor.

The Mammalia, too large to be put into spirits, should be skinned, and care taken to leave the feet and head (from which the brains must have been removed); or, if that be not possible, we must at least send the jaws. We shall hereafter speak of the methods to be used and the precautions to be taken for preserving skins, and for animals which are put into spirits.

When we can add the skeleton to the skin, it would be a great service to science; this would be a very easy operation for the surgeons of ships, who might feel sufficient interest in zoology.

It is not necessary to mount the skeletons. After having boiled the bones, taken the flesh off, and dried them, we put all those belonging to the same animal in a bag, filling it up with moss, sea-weed, shreds of paper, or any other soft and dry substance, that they may not bruise each other. We envelope those in paper, which are very fragile, and take great care not to lose any.

Those who procure us birds, must take care to proportion the shot to their size, not to injure the skins. When the bird falls, they must wipe the blood away as much as possible, and put a little cotton in the beak, that the blood may not run from it and injure the feathers, particularly those of the head. After the bird is cold, and the blood is coagulated, they must take it by the claws and the

tail to place it in a paper, of the form of a hollow cone.

Birds are skinned like quadrupeds, and we take care to preserve the feet and head with the same precaution; but they should be more immediately skinned, because when putrefaction takes place, the feathers fall off. In cutting the skin we take care to scatter the feathers, that they may not be soiled. We leave the os cocygis (plate 2. *c.*) with the skin, otherwise the feathers of the tail would be liable to fall off; we must also leave the bones at the extremity of the wings. If the bird has a fleshy crest, the head must be preserved in spirits. When there are several of the same species, it will be always useful to send one of them entire in this liquor. It is desirable, if possible, to procure at the same time the male and female, and individuals of the same species, of different ages: for birds alter much according to their age: there are several which have even been taken for different species. It is also very useful to have the nests and eggs. To preserve the eggs, we make a little hole at one end, empty it, and then fill it up again with wax. The skeletons of those birds too large to be put in spirits, should also be sent.

It is useless to stuff birds. They would occupy too much room, and this operation, which cannot be done well by any one who is not experienced

in it, is much better performed when the skins have arrived at their destination. It is sufficient, for the skins, the feet, and head, to be well preserved.

Although there are several salt-water fish which are found almost universally, the greater number belong to particular shores and gulphs. It will be useful therefore to send all those which we find in countries not visited by naturalists, those even which are sold in the markets. As to fresh-water fish, the species differ, not only according to the country, but even according to the rivers and lakes they inhabit; it is therefore essential to send all which can be procured. We put them into spirits, or when they are too large, send the skin only, merely dried, taking care to preserve the head and fins.

It is the same with reptiles. — In skinning serpents we must take care not to injure the scales; and great caution must be used not to break the tails of lizards. It is desirable to send the skeletons of fish and reptiles which are too large to be put into spirits; these skeletons need not be mounted.

It is sufficient to take away the flesh rudely, and to dry the bones together thoroughly, without separating them. The whole skeleton should be placed in a box with cotton or very fine dry sand. If it be too long, it may be divided into two or three parts.

Insects are very various according to the climate and the nature of the soil. — We must not confine ourselves to the largest and richest in colour. We must collect all without distinction. We catch those which are furnished with wings and fly about plants, with gauze nets; those which swim in the water, by the same means. We seize with pincers those which live on putrid and disgusting substances, and we first throw them into camphorated spirits to clean them. A multitude of insects nourish themselves on trees: we procure the greater part by carefully searching under the old barks of the trunks, and by shaking the branches over a cloth or reversed umbrella. When we take an insect, we seize it by the breast, and stick it in a box, on cork, or wax, with a long pin; we must take care that the wings of butterflies, which continue to flutter until death, do not touch any thing. When the insects are dry, we put them into pasteboard boxes, with cork or wax at the bottom, pinning them securely, to prevent their being detached. It is very useful to procure the caterpillar as well as the butterfly. When we find a caterpillar only, it should be put into a box with some leaves of the plant on which it was found, that it may transform itself. A small hole should be made in the box to admit the air. All insects, except butterflies, may be put into spirits, it is the best method of sending those which

are large, and it has the advantage of preserving the interior organs, which may be examined when there is occasion. As heavy insects may unfix themselves from the cork or wax in the pasteboard boxes, and one loose insect may break all the rest, it is a more simple method of preserving *coleoptera* to place them, when dry, in a box of very fine sand. We first put a row of insects on a layer of sand, then cover them with another layer of sand, about an inch thick; we then place a second row of insects, and continue this method until the box is quite full: the sand must be well heaped up, that nothing may be deranged by the carriage. This is also a good method for *crustacea*. It is evident that we cannot employ it for butterflies, or any animals of a soft substance. The first ought to be placed in boxes, the latter in spirits.

We particularly desire travellers to send spiders and insects which are said to be venomous; those which are most destructive, such as *termites* or white ants; and to add the nests when they are sufficiently solid for conveyance; the insects to which medical properties are attributed; those which are employed in dyeing, as the different species of *cochineal;* the animal which produces the gum lac; those whose excretions, mixed with oil, form a species of wax, used for candles; the different species of silk worms, their cods; the butterflies to which these silk worms give

birth, and patterns of their silk when manufactured, (Madagascar, the north of India, China, offer several *silk worms* different to our own;) different species of *domestic bees*, with notes on the manner of rearing them, their history, &c.; the productions of insects which may interest by their singularity, and which are calculated to give new ideas on the instinct of these animals.

It must be remembered, in collecting insects, to bring a branch of the tree or plant with which they nourish themselves, and we should send this branch in a herbal, with a number corresponding to that of the insect. As to *crustacea*, or crabs and lobsters, we especially desire those which are eaten; taking care to note the names under which they are known, those which inhabit the sea-shores, those of fresh water, and those which live on land. We must content ourselves with sending the shell only of those which are of a very large size, and we must wash these shells well in fresh water before we dry them. The smaller crustacea should be put into spirits; but before we do so it is very necessary to cleanse them in fresh water, to free them entirely from the marine salt with which they are impregnated. Without this, the greater part would spoil in the spirits of wine; this has been the case with the rich collection of Peron.

Mollusca ought to be put into spirits: those which have a shell of some size should be separated

from it, and the shell wrapped in paper, with a number corresponding to that of the bottle in which the animal is enclosed. To separate the animal from the shell, we plunge it into spirits of wine, and when it is dead, we easily take it out with a pointed instrument.

The sea is inhabited by an infinity of soft or gelatinous animals called *mollusca*, some of which live isolated, others in society. The greater part of these animals are unknown, and the study of them is so much more important, as they give us general notions on the organization of beings, and the diversity of forms in which animated nature presents herself.

Surgeons and lovers of natural history might procure us a great number of these animals, in their voyages. It is sufficient to take them with a net, to wash them well in fresh water and put them into spirits, with the above precautions; immediately to write the latitude of the place where they were taken; if they live singly or in numbers; if they are phosphoric; if they were deep in the water, or on the surface. As the colours of gelatinous animals do not always preserve in spirits, it is proper to make a memorandum of them.

At a great depth in the sea exist multitudes of animals which never appear on the surface, and which are entirely unknown. We might procure many by joining something to the sounding-lead, —

a hook, or a small net, for instance; or even by securing those which are brought up by the lead. We put them into spirits after washing them in fresh water.

We should be as anxious to collect terrestrial as aquatic shells; and fossil shells are particularly interesting. The very fragile shells, the *echini*, the *star fish*, &c., should be wrapped with much care in cotton, and each placed separately in a box. The madrepores of any size should be fixed with an iron wire to the bottom of the case in which they are placed.

Worms, especially those which are found in the bodies of other animals, should, like *mollusca*, be sent in spirits.

It is to be desired that every animal which is sent in the skin, in spirits, in the skeleton, &c., should be accompanied by a note, stating precisely —

The country in which the animal was found.

The season in which it was taken.

The manner in which it nourished itself.

Its habits.

The name it bore in its own country.

If it is useful or destructive.

The uses which are made of its skin, its flesh, its fat, &c.

The popular opinions or superstitions which relate to it amongst the natives.

These notes should each have a number, cor-

responding to the number of the animal to which they relate.

It is essential that these numbers should not be written on white paper or on parchment, but painted in oil on a piece of wood or metal, and fastened with a brass wire, either to the skins enclosed in the cases, or to the bottles and barrels which contain the animals. It would be easy to have numbers made with a stamp on plates of tin, we should then be sure that there was no uncertainty in the cyphers. It is also possible to have plates of pewter sufficiently thin to engrave numbers on them with a steel point, and these engraved plates may be attached to the animals we put into the spirit. We may also fasten to each object, whether in spirits, dried, or in cases, a small piece of packthread with knots: these knots must form two series, separated by an interval; the first series marks the tens, the second the units: and by this means we can indicate any number we please.

We must now speak of the method of packing zoological objects, so that they may arrive in Europe in a good state of preservation.

The objects which we send are either skins of animals, or the animals entire in spirits. The skins of animals or birds, would be attacked by dermestes and similar insects, and in warm countries they are extremely liable to be injured if we do not take pains to preserve them. The surest

method is the use of the arsenical preservative, known under the name of Becœur's soap (see page 16). This is the preservative employed in the Galleries of the Jardin du Roi, and its success is certain. We should use it more especially for unique and precious objects, for the preservation of which we are particularly anxious. The use of this preservative requires much precaution, and we must only put it inside the skin, and not on the outside, because in touching and shaking the skin to mount the animal, we may experience its pernicious effects. It would be a good method to note the objects which are thus prepared, that in unpacking the cases we may shake the skins carefully. We think it may be dispensed with until the period of their being mounted for the cabinet, and the following is the method of supplying its place.

Spirits of turpentine, oil of petroleum, and camphor, do not kill insects, but they disperse them. These means are insufficient, and are inconvenient, on several accounts, for objects which we preserve in collections; but they are sufficient to protect them during their transportation in cases. When we pack the skin of an animal, we commence by shaking away the insects already lodged; it will then be sufficient to pass all over the inside of the skin with a brush dipped in oil of petroleum, or spirits of turpentine. We lightly pack the skin with cotton, impregnated with the same substances. We then

place the skin in the case, which we cover all over with pitch to defend it from damp, and to prevent the air from getting in. For want of oil of petroleum and spirits of turpentine, we may use a decoction of very bitter and aromatic herbs, with which we wet the skins before we enclose them, and besprinkle them internally and externally, with pounded tobacco, pepper, and all-spice.

The same precautions are used for birds: each bird must have a little cotton inside it, not to give it its form, but that the different parts of the skin may not touch. It should then be placed in a paper bag well closed, and the bags put into a case covered with pitch. The above methods are simple and easy, and take but little time.

We are now arrived at the preservation of animals in spirituous liquors. Of all vessels, glass-bottles are the best: whatever precautions are taken, a portion of the liquor will evaporate through the pores of the wood; square bottles are to be preferred, because they arrange better in cases. The perfect preservation of the animal depends on the quality of the liquor, the manner of placing them in the bottles, and the method of luting these bottles. We will give some important instructions on this point, taken from a memoir of M. Peron's, inserted in the second volume of his Voyage to Australasia. We know that this naturalist, to whom the Royal Museum owes its richest collection of *animals*

without vertebræ, succeeded perfectly, and it was not until after many researches and experiments, that he discovered the simplest and easiest means.

The spirituous liquor to be used, must be from 16 to 22 degrees of the aerometer of Baumè; if it be stronger, it entirely destroys the colours of the animals. We only make use of it at 22 degrees for Mammalia. Gin, arrack, rum, brandy, in short, all spirituous liquors are equally good, but we prefer those that are least coloured. Before we put the animal in the liquor, we must take away all the mucosites which surround it with a brush, and free it from the dirt which would soil it; we must then take precautions that it may not touch the bottom of the vessel; without this, it not only sinks down, but becomes corrupted. M. Peron proposes to fasten the animal to a flat piece of cork, which holds it suspended in the liquor. We can thus place several animals in the same vessel, either by the side of one another, or at different heights, they will float in the liquor without touching, and the mucous substances which detach themselves from them, fall to the bottom of the vessel. M. Peron affirms that thus floating in the liquor they cannot be injured, although the bottle or vessel may be shaken or overturned. As this method is not very easy, we may content ourselves by placing each animal in a bag of very fine linen, or in a net; we tie these bags to the cork, and they remain sus-

pended in the vessel. We must take care to make a little incision in the abdomen of animals with vertebræ, that the liquor may penetrate into the interior of the body. M. Peron advises the use of camphorated spirits, because the camphire augments the preserving quality of the liquor, without adding to its force. But besides that camphire is expensive, its dissolution makes the animals tough, and renders them difficult to dissect. It is requisite to add to the liquor after the animal has been in it some days, to ensure its preservation; this precaution is especially necessary for those which are most susceptible of corruption. We must then lute the bottles; we should have a luting, easily prepared, which dries and acquires all its solidity even in the moment of employing it, on which spirits of wine has no effect, which does not scale off, which penetrates the pores of the stopper, and which perfectly adheres to the glass. Cork stoppers are preferable to all others, because those of glass often break by the evaporation of the spirits of wine.

The phial or bottle being well corked, the following is the luting, to which M. Peron has given the name of *lithocolle*.

Common resin.

Red ochre well pulverised.

Yellow wax.

Oil of turpentine.

We put more or less resin and oxide of iron, or

oil of turpentine and wax, as we wish to render the luting more or less brittle or more or less elastic. We can determine the proper quantities in the first trial. We melt the wax and the resin, then add the ochre in small portions, and at each addition stir it briskly with a spatula; when this mixture has boiled seven or eight minutes, pour in the oil of turpentine, mix it, and continue to boil it. We must take proper precaution to prevent the inflammation of these substances; in case it does take place, we must have close by our side a lid with a handle to it, to cover the vessel and extinguish the flame immediately. The vessel should have a handle, and be able to hold three times as much as the quantity of luting we wish to make. To ascertain the quality of the luting, we put a little from time to time upon a cold plate, and we instantly see its degree of tenacity. One great advantage of this luting is the being able to prepare it aboard ship, and to employ it as soon as we have procured the *fish* and *mollusca*, and put them into spirits. After having corked the bottles, and wiped them well with a dry cloth, to take away all humidity, we heat the cement to the boiling point; we stir it well from the bottom, fasten a piece of old linen to the end of a stick, and with this rude brush we apply a layer of *lithocolle* over the whole surface of the cork; sometimes the luting, by penetrating the cork, makes the spirits of wine evaporate and burst

the surface this forms small openings, which we stop perfectly by passing a second coat of lithocolle over the first, when it is cold. When the phials are small, we plunge the neck of them into the lithocolle, and by repeating this two or three times, it acquires the proper thickness. It is useful again to cover the bottles thus closed with a piece of linen, firmly tied, and imbued with liquid pitch, and for large bottles, to support the cork with a strong piece of string, which by being fastened to the circumference of the bottles, forms a cross above the cork. Bottles thus prepared, may, without inconvenience, be turned over in all directions, exposed to all the tossings of the tempest, and support the strongest heat without the alcohols escaping.

We have thus given what has appeared to us most essential to the collection and preparation of objects of zoology. Those who desire more detailed instructions, will find them in the Taxidermy of M. Dufresne, chief of the Zoological Laboratories of the Museum, Paris.

After having pointed out in a general manner how we may enrich our collections, we feel it a duty to particularise those animals whose existence is known to us, but which are either wanting to the Museum, or are not in a good state, and which we are most desirous of procuring.

From Western Africa.

The skeleton of the *hippopotamus.*

The skeleton of the Ethiopian wild-boar (*sus Ethiopicus.*)

The skins and skeletons of different species of gazelles, and especially those whose horns are curved in front.

The *pangolin* or scaly ant-eater, preserved in spirits.

Small *ostriches*, newly hatched, in spirits.

The *manatus* or sea-ox.

The great *panther* with large eyes.

The *dipus* or *jerboa.*

From the Cape of Good Hope.

Every species of *gazelle* and *antelope* which can be procured, both skins and skeletons.

The skeleton of the *hippopotamus*, that of the *rhinoceros* with *two horns;* that of the great *ant-eater* of the Cape (*myrmecophaga jubata*); that of the *sus larvatus*, which has large tubercles on each side of the head, and which is represented by Daniels, plate 21.

The skin of this same boar, fit for stuffing.

The *daman* of the Cape (*hyrax Capensis*), vulgarly called *klipdase* or *rock-badger*, in spirits, as many as possible.

The *ratel* (*fizzler* of Pennant, and *stinking badger* of La Caille) or small bear which eats honey.

All the species of *jerboa* (*mus jaculus*).

The bird called the great serpent-eater (*falco serpentarius*); the skin and the skeleton.

The *honey-guide* (*cuculus indicator*).

The republican (*loxia socia*). The skins of the two last in as great a number as possible, and also some specimens in spirits.

Madagascar.

Hedgehogs.

Lemurs.

The aye-aye, or *sciurus Madagascariensis*, described by Sonnerat.

Madagascar is so little known, that almost every thing which can be procured from its interior, is likely to be new to naturalists.

India.

The apes with long arms, called *gibbons*; skins and skeletons, and, if possible, in spirits. An adult *ourang-outang*, the skin and skeleton. The *crocodile* of the Ganges, with the long and slender muzzle.

The *pangolins*, of which there are several species, they are also known by the name of scaly lizards.

From Thibet it is desirable to obtain, —
The grunting ox with a horse's tail (*bos gruniens*).
The *Cachemire goat.*
The *musk deer.*
Gazelles.

From the Indian Archipelago, chiefly the Moluccas.

We most earnestly desire a species of fish from this part of the world, called *dooiong djugong* or marine cow; the skin and skeleton, and if possible its viscera, or at least its stomach and larynx, in spirits.

The *phalangers* or *couscous* or *coescoes* in spirits.

The *lemur spectrum*, or ape, with the hind legs treble the length of the fore.

Those who are able to land in Sumatra, are requested to obtain information respecting a large animal described by Newhoff, under the name of *succotiro.*

From the West Indies.

We principally request the musk rat or *pilory;* a number of them in spirits.

From Cayenne.

Every species of *ant-eater;* the skeleton, and in spirits.

The *sloth*, and particularly the large one; the skeleton, and in spirits.

Every species of *deer* and *roe-buck*; the skin, and the skeleton.

The great howling ape (*mycetes*); the skeleton, and in spirits.

Several tongues and larynxes of the same animal.

Terra Firma, and the mouths of the Oronooko.

As Martinique and Cayenne have frequent communications with the coasts of Terra Firma, and the mouths of the Oronooko, it is important to know the names of some of the animals which abound in these regions, and to procure them under those given them in their own country.

It would be easy to procure, from Cumana, the bird called *guacho*, which inhabits the caverns of Caripè, and from which the Indians extract a greasy fluid like oil.

We require from Porto Cabello, the fish of Lake Valencia; and from Nueva Barcelona, the *bava*, a species of small crocodile, from two to three feet long, unknown in Europe, and different to the monitor; the *tatous* (*armadilloes*, *dasypus*); the spiny rat of Arzara, (*Echymis*). Amongst the living animals which might arrive from Spanish Guyana, we especially desire to have the *caparo*, the *capuchin* of Oronooko, the *viudeta*, the *cacajo* or *mona-*

rabon, the *wava pair*, the *mana viri*, and especially the *dooroocooli* or sleeping ape, also known under the names of *cousi-cousi*, *cara-rayada*, or *mono-tiger*.

It is easy to procure the skin and skeletons of these apes, and to bring several of them alive.

It is also desirable to procure a skin of the black tiger of Esmeralda, as also the skins of the different species of *roe-buck* (*venados*) of the Llanos of Cumana and Barcelona.

From New Holland, and Port Jackson.

Different species of *ornithorhyncus* (*platypus* of Shaw), a number, if possible, in spirits. *Phalangers*, and *dasyuri*, and others of the genus *didelphis*, in spirits.

Besides the objects we have already enumerated, we desire, from each country, all the small species of apes, and animals akin to them. *Weasels*, *pole-cats*, *moles*, *squirrels*, *bats*, and all small quadrupeds without distinction.

Seals, the species of which are very various, and are found on the coasts of all seas.

Every species of *fish* and *reptile*, especially the *fish* which may be eaten.

Mollusca and *marine worms*.

VEGETABLE KINGDOM.

THE riches of the Museum relative to botany consist,

1st. Of living vegetables cultivated in the garden.

2dly. Of a collection of dried plants or herbals, and all the products of the vegetable kingdom, which it is possible to preserve and make known.

The collection of a great number of foreign plants ought not to be considered as an object of luxury or curiosity. It is useful to the progress of science. Travellers have neither the time or facility of describing and drawing remarkable plants in the places where they gather them. It is only when they are cultivated in our gardens, that they can study them in all the periods of their vegetation, draw them when they are in flower, and try to multiply them, if their culture promises any advantages. We must not forget, that several foreign plants, which are now spread in other parts, were first cultivated in the Jardin du Roi. Every one knows that the coffee, which now grows in the islands of America, proceeded from a plant raised in our green-houses; and, still more lately, the bread-fruit tree has been sent from our green-houses to Cayenne. We must add, that in a multitude of slips and seeds of ornamental plants have been cultivated in the Jardin du Roi, which

are now become an object of trade, as well as several useful trees which now ornament our parks, and some of which have been introduced into our forests. In the Jardin du Roi we cultivate every plant necessary for study; and great attention is also paid to those which are useful or pleasing. When they fructify, we gather the grains, and distribute them gratuitously to all those whom we believe capable of multiplying and propagating them. We also give slips of those trees which have not yet borne fruit.

It would be extremely advantageous to bring living plants to the Museum; above all, those which are known to be useful in the countries where they grow: but the conveyance of living plants exacting much care and giving much trouble in vessels, we do not desire to receive any in this state, except those which cannot be propagated from grains, with the same qualities which a long culture has obtained from them; this number will always be very small.

The seeds should be gathered when very ripe, and then put into paper bags, with a note, indicating:

If the vegetable be a tree or an herb.

In what country it was gathered.

The nature of the soil where it grew.

The elevation of this soil above the level of the sea.

Its native name.

If it be used as food, in medicine, or in the arts; and if its history, and the properties attributed to it, offer any remarkable peculiarities.

We are particularly desirous of having notes on the vegetable poisons with which the natives infect their arrows, and the manner of gathering and preparing them.

To be certain of the maturity of seeds, we must gather them when they easily separate from the plant. In several instances, we may take the branch which bears them, that those which are not perfectly ripe may become so.

The bags containing the grains, well dried, ought to be put into a case covered with pitch, that they may be protected from damp, insects, and mice.*

The oily grains lose their germinating faculty soonest. The seeds of tea, coffee, the glands of most of the oaks, are of this kind. These seeds should be put into sandy earth; we strew a depth of two inches of it at the bottom of a box, and we range the grains in this earth at distances equal to their size; we cover them with about an inch of earth, in which we put a fresh layer of seeds, and proceed in this way until within a foot of the top of the box;

* M. de Candolle recommended me to pack all seeds, collected in a moist country or season, in charcoal. Honey is also said to be a good preservative.

we must take care that the box is quite full of sand, that nothing may derange the seeds; the box ought to be covered, but in such a manner that the air may penetrate. We make an opening at the top, which we cover with a trellis of brass wire, to admit the air, without the mice or other animals being able to reach the earth. The grains germinate during their passage. When the case arrives at its destination, we find the embryos of the seeds are developed, and we immediately put them into a proper soil: it is in this way that MM. Michaux, father and son, brought to Europe so many species of oaks from North America.

Although certain seeds with a hard shell, such as walnuts, plums, &c. do not come up until a long time after they have been sown, it would be proper, when the kernel is oily, to follow the method we have pointed out, that they may not turn rancid on the passage. This precaution is also useful for the family of laurels (*laurineæ*), and that of myrtles (*myrti*), especially when the vessel has to cross the equatorial seas.

When we wish to send the seeds of a pulpy fruit, we must separate the grains from it; when the commencement of its putrefaction announces their maturity. We dry them, and place them in paper bags.

We now proceed to collections of dried vegetables, and other productions. It is by the help

of the former, that we are able to know, compare, and describe plants, to distinguish their species, and contribute to the progress of botany. By their means alone, we can invariably fix the nomenclature and classification of vegetables. The travels of several naturalists have already rendered the collection in the Museum very considerable, and certainly the richest in Europe; but it still wants many things; there are many gaps, which, in a few years, will be doubled, unless those who visit foreign countries will take some interest in filling them.

This collection, which already occupies four rooms in the Museum of the King, is composed of herbals, fruits, dried or preserved in spirits, gums, and resins, specimens of wood, and some other productions of the vegetable kingdom, which may be useful in medicine, or the arts. The trouble of enriching it is not so great as that required for the augmentation of zoological collections.

The plants which are destined for herbals ought, as often as possible, to be gathered in flower, and in fruit. When the plant is small, we take it entire, even with the root; when it is large, we cut branches fifteen inches long; we put the plants well extended between leaves of paper, under a board (using pressure to prevent them from curling up) which we do not remove until they have become flat. It is generally sufficient for their perfect desiccation, that the specimens should be separated by several

sheets of brown paper. In humid countries and seasons, it is desirable to accelerate their desiccation by an artificial heat. For that purpose, we put a number of plants between two planks, separated from each other by two or three sheets of paper, and place this packet in a stove or oven, after the bread is taken out; this quick method does not even alter the colours. When they are dry, we change the paper. There are some plants which are very watery, such as *bulbous plants*, *orchideæ*, &c. and which continue to vegetate in the herbals several months after they have been placed there. When these plants are gathered in the state in which we wish to preserve them, we plunge them for a minute into boiling water, then put them between two leaves of brown paper; they will afterwards dry quickly, as the action of the boiling water will have destroyed the life of the plant.

On each packet of plants of the same species, we put a note, indicating the name the plant bears in its own country, the height of the country above the level of the sea; in short, the same notes which we have required for living vegetables. These instructions are extremely important for the geography of plants, to the progress of which, Humboldt has so much contributed. It is also useful to notice the height of the plant, the colours of its flowers, and the odour they exhale, as these cannot always be learned from a herbal.

Dried fruits should be sent in cases, with a ticket which indicates the branch of the plant to which they belong. We do the same by gums and resins. Pulpy fruits should be sent in spirits, each in a separate bottle.

Herbals and fruits, when they are perfectly dry, should be packed in cases covered with pitch, to defend them from mice and insects; and it will be prudent to add a little cotton, imbued with oil of petroleum, or oil of turpentine.

It is also desirable to send specimens of useful woods. These specimens ought to be about ten inches long, and, if possible, the width of the tree; we also wish for a longitudinal and transversal cut of the tree: but it is most essential to put a number on the wood, corresponding to the branch of the tree in the herbal, for botanists are still ignorant to what trees several of the woods belong which are articles of commerce.

Amongst the objects sent to us, we shall, doubtless, find many which we already possess; still they may be useful. There are plants in our gardens which have degenerated, the seeds of which it is desirable to renew. There are some which, with difficulty, fructify in our green-houses, and the seeds of which are not in sufficient quantities to give to all those who request them. Thus, the *phormium tenax*, or flax of New Zealand, the fibres of which are much stronger than those of hemp,

might be plentifully cultivated in several of our provinces, where it succeeds perfectly, although its seeds ripen with difficulty.

The plants preserved in herbals, which we already possess, may be employed in making exchanges with other countries, and thus establish one nomenclature.

Gums, resins, dye-woods, vegetable productions employed in medicine, can be analysed, and positive information given on objects which are now but imperfectly known. We must allow that, notwithstanding all our care, there are always some objects amongst our collections which are destroyed by time, and which it is useful to renew.

Collections of vegetables, from whatsoever country they come, always present something new; and there are some places so little known, that we desire to receive every thing which can be procured from them.

We will now give a brief list of a few objects which would be particularly useful.

The North of Europe.

The Lithuanian pine.

The Northern Coasts of Africa.

The lawsonia (Fam. salicariæ), the leaves of which dye a yellowish red.

The oak with sweet acorns, (Fam. amentaceæ.)
The pyrethrum.
The sideroxylum of Morocco, (Fam. sapotæ.)

Senegal.

The gum-tree of Senegal.
The detar (detarium).
The galega (Fam. leguminosæ), and the indigoes which serve for dyeing.

The Cape of Good Hope.

The liliaceæ remarkable for the beauty of their flowers.
The proteæ and gardeniæ (Fam. proteaceæ et rubiaceæ).

The Isle of France.

The true ebony wood.

Madagascar.

The vahè which yields the gum elastic.

The Levant.

The true hellebore of the ancients (helleborus orientalis, Fam. ranunculaceæ.)

The astragalus (Fam. leguminosæ), which yields the gum adragant.

The balm of Judea.

The seeds of the weeping willow (Fam. amantaceæ), and a small plant of the male tree.

Persia.

The assa fœtida.

The willow called bismith.

India.

The salsaparilla of commerce.

The nelumbo (Fam. hydrocharideæ).

The nepenthes.

The terminalia (Fam. elæagneæ).

The canarium.

The mangostana (Fam. grettiferæ).

The kaki (diospyros kaki. Fam. guaiacanæ or ebenaceæ).

The rose laurel (nerium. Fam. apocyneæ), which affords a beautiful dye.

The apocyneæ which yield the gum-elastic.

The tree which produces incense, and which grows in the environs of Calcutta.

Carthagena.

The balsam of tolu, (toluifera balsamifera. Fam. terebintaceæ).

Terra Firma and the Mouths of the Oronooko.

The vessels which go to Martinique and Cayenne, having, as we have already said, frequent communications with Terra Firma and the mouths of the Oronooko, might easily procure us the plants we chiefly desire from these regions, by asking for them under the names by which they are known in the country.

From Cumana, branches in flower, and ripe fruits of the cuspa, which we call jesuits' bark (cascarilla), and which we must not confound with the cuspara of the missions of Caroni. The cuspara furnishes the quinquina (jesuits' bark) of Spanish Guyana, called in Europe, cortex angusturæ.

The vessels visiting the ports of Guaira and Porto Cabello might bring some branches in flower, and some fruits of the cow-tree (arbol de la vacca), which resembles the chrysophyllum in the family of sapoteæ. This tree grows near Barbula, between Porto Cabello and Nueva Valencia. It will be highly important to bring also several well-corked bottles of this vegetable milk, which gives nourishment to the inhabitants.

Santo Thomas de Angostura, and the Mouths of the Oronooko.

The leaves, the flowers, the fruit, and the farina of

the trunk of the moriche palm, celebrated amongst the Guaraunos Indians. A branch with the flowers, as well as the fruits, of the cuspara or quinquina of Caroni (cortex angusturæ). Branches in flower and fruits of the tree which affords the almonds of the Rio Negro, and which bears the name of almendron or juvia (bertholetia excelsa). The branches, the flowers, and the fruits of the chicki-chik palm, of which they make cordage in the missions of Oronooko.

New Holland.

Cucalyptus and casuarina (Fam. myrti et coniferæ.)

Besides the collections of living vegetables, plants preserved in herbals, and products of the vegetable kingdom, the Museum possesses an assortment of tools, machines. utensils, and substances, employed in gardening, in agriculture, and in rural economy. This assortment, already very rich in the implements of the different nations of Europe, still requires the tools, &c. of other parts of the world. They would be received with pleasure and gratitude.

MINERALOGY AND GEOLOGY.

Minerals are found either in regular and geometrical forms, which bear the name of crystals, or in masses more or less irregular. Amongst the crystals, there are some so situated, that we can, without injury, separate them from their support or the substance which surrounds them. Others compose groupes projecting beyond their support, and others appear buried in cavities in the interior. We must procure, as frequently as possible, the specimens in these three states. As regards the crystals inserted within the surrounding substance, we detach parts of this substance with them, at least from three to four inches large in every sense, so that we may observe the different minerals which accompany the crystals. We also detach portions of the masses composed of needles, fibres, of the granulous or compact, taking care to choose them in a state of freshness, and free from alteration, which is most obvious in those situated near the surface.

In collecting fragments or specimens of rocks, minerals, volcanic products, or fossile organised bodies, it is most essential to note their stratification well, that is to say, the nature of the place in which they are found, and their relative position

with the minerals which environ them. In detaching specimens from these mines, they must take care to leave round the principal metal, either portions of the other metals which are associated with it, or of the stony substances which often accompany it, especially those which are crystallised.

If they find earths which contain the remains of organised beings, such as the bones of animals, shells, impressions of fish and vegetables, they should collect, with care, specimens of these different bodies, having them enveloped in a portion of the earth or stone in which they were fixed.

In case the traveller should find any traces of volcanic origin, he should procure specimens of the different substances thrown up by explosions, some of which are in a state of stone like basalt, others similar to glass like obsidian, others in a state of scoriæ. For those that are in prisms, care should be taken to note the form of these prisms, and the extent they occupy in the soil.

A ticket should be fixed to each specimen indicating the name of the country where it was found, the spot from which it was taken, the distance of this place from, and its situation with respect to, any known town in its neighbourhood; as nearly as possible, the nature and general aspect of the soil, and its elevation above the level of the sea.

Wherever warm or mineral waters are found, care should be taken to fill phials with them, which should be well corked and luted.

Since we have abandoned systems to confine ourselves to the observation of facts, and to compare these observations; since we have renounced the attempts to guess the origin of things, in order to ascertain their actual state; geology, which formerly belonged to the domain of imagination, has followed the course of the positive sciences. This regular method has not only extended our knowledge of the construction of the earth, but has even produced results useful to the arts. We are far however from knowing the different countries of the globe as we know Europe, and the facts necessary for fixing our ideas can only be collected by travellers, who are well informed on, and devoted to, this kind of study. But it is very easy for those who visit distant countries, especially beyond the tropics, to procure us important notices, and to send us productions, the examination of which can alone enlighten and furnish us with ideas on the nature of the soil in different countries, and consequently the general disposition of the minerals which cover the surface of the globe. On all coasts, in all the islands, where a vessel harbours, those who go on shore can without much difficulty procure objects, which, not possessing any value in themselves, may become instructive and interesting from the notes by which they are accompanied. They first collect, on the borders of rocky torrents, fragments which indicate the nature of the rocks over which they

pass. They will choose the largest, note their size, and break some of these fragments. They will also take some of the smallest, exemplifying the variety of aspect. The further these fragments are brought, the less they become.

Wherever a rock rises, either in the middle of a water or country, travellers must observe if this rock be all of the same substance, whether homogeneous or composite, or if it be formed of different layers. In the first case, they will detach a fragment. In the second, they will observe the relative position of the strata, their inclination and thickness; they will take a specimen of each, putting the same mark on all the specimens which come from the same mountain, and a particular number on each of them, to indicate the order of their superposition or their reciprocal situation. If the traveller who will collect these specimens, can join a sketch to the simple mention of these particulars, indicating the form of the mountain, and the thickness and inclination of these layers, he will perform an essential service. In case the rock be an isolated peak, it will be well to examine and draw two faces, to confirm the inclination of the strata.

It will be useful to collect the sand of rivers, especially those which carry metallic spangles with them; but the sand must be taken as far from the mouths as possible.

In some countries, isolated masses are found, to

which the people attribute a singular origin; the traveller will take fragments of them, some may be aerolites, others may have been transported by the revolutions of the globe.

In gathering the fragments of rocks, mines, volcanic productions, fossil organised bodies, the most essential thing is to notice their bearing, that is to say, the nature of the soil where they are found, and their position relative to the minerals which environ them.

The basaltic layers merit a particular attention, either in themselves, or with respect to the soils which support or which cover them; the traveller will remark if they are divided into irregular masses, in tables, prisms, and what is their disposition. He will observe if they contain the remains of organised bodies, and he will take care to collect specimens of the different states, as well as of the substances upon which the basalt reposes. He will particularly ascertain if there be any interposition of scorified matter, or of those beds of an earthy aspect, to which the Germans give the name of *wakke*, and which are not supposed to be volcanic.

The trap porphyries or trachytes, merit the same attention: they are particularly distinguished from primitive and transitive porphyries, by the absence of quartz and the presence of pyroxene.

The traveller will not trouble himself with

pieces of a large size; specimens from two and a half to three inches, and about an inch and a half thick, are sufficient. He will only take large masses when they contain a fossil animal.

To pack the specimens, we first cover them with fine paper; above this paper we put that on which the note is written, then a second fine paper, which we cover with tow, and envelope the whole in brown paper. We then arrange all the specimens in a case, close upon one another, filling the interstices with cut paper or tow, so that the whole forms a mass, which nothing can disturb. The case should be covered with pitch, to defend it from air and damp.

We have a few words to add respecting the packing. When the cases are filled, closed, and covered with pitch, they should be enveloped in an oiled canvass, and placed in a part of the vessel where they may remain until their arrival; sheltered as much as possible from excessive heat, and out of the reach of rats. It is desirable that they should not be opened or unpacked at the quays, or custom-houses, or until they reach their destination, as there is always a risk of their being broken or injured. *

* Having separated a specimen from the rock, its sides or edges should be broken or reproduced with the small hammer, (striking the specimen as it rests in the palm of your hand,) in

Few travellers will want a sufficient interest in Natural History, but many may not be able to spare the time to act up to all the particulars of our instructions. Even to these we shall be grateful, if they will send us skins of animals in cases covered with pitch; small animals, thrown pell-mell into a barrel of spirituous liquor; seeds gathered at random; and minerals, with a note indicating the place where they were collected. We will only add, that the more attention they can afford to our instructions, the more they will realise our views for the benefit of science and our country. These instructions have not been compiled for those who make Natural History a secondary object, but for those who devote themselves to it from preference or opportunity; we must observe, that we will gratefully return such of our duplicates as they may desire, towards the completion of their own collection, in exchange for the objects they may transmit to us, by such European vessels as touch in their neighbourhood.

order that they may be perfectly fresh, the original surfaces being subject to alteration, from long exposure to the atmosphere.

BOTANY.

GENERAL OBSERVATIONS.

THE nearer we advance to the equator, the larger we find the plants. The most commodious size for the paper of the herbarium is from fifteen to eighteen inches long and eight to ten wide. We should be provided with several planks of the same size as our paper; these planks should be formed of two thinner ones, their surfaces being glued together; so that the grain of the wood of one may go length-ways, and the grain of the other breadth-ways; without this precaution they are apt to break. We must have either a press, or a proportionate number of straps with buckles at one end, which will serve to press the packets of blotting-paper between the two planks. We should also have a tin box, and a large book of blotting-paper, with a loose back, shut with little straps, and capable of being carried in the form of a knapsack. This book and box will serve, during a journey, for a temporary herbarium.

When we are stationary, we take the plants from the book or box, and place them in sheets of dry blotting-paper; between each sheet containing a plant, we must be careful to place two or more dry

and empty sheets, and then press the whole between the planks with the straps, and expose them in a dry, warm, and airy place. We ought every day to change the damp paper for dry, until the desiccation is completed. We may shorten this operation a little, by only changing the intermediate sheets, and always leaving the plant in that in which it was first placed; but in this case the number of intermediate sheets must be more considerable. When we plunge *saponaceous plants*, *lilaceæ*, *orchideæ*, &c. into hot water to destroy their vitality, we must always except the flowers; and after this process, we must be very careful to change their papers.

Very delicate aquatic or marine plants require peculiar care: we must float them in a basin of fresh water, and then pass a piece of very strong white paper under them, by which we raise them slowly and obliquely, that they may remain attached in their natural position. If the plants are *extremely* delicate, we must use talc or glass.

When the fruits are of a dry nature, it is often more advantageous to leave them in their husks without sifting them; but when the fruit is fleshy, we must separate them.

When fruits are dry and coriaceous, they do not require any other preparation than being preserved in a dry place, not exposed to the sun: and those whose valves open with desiccation, must be tied round with a piece of strong thread.

If the trunk of a tree does not exceed a foot in diameter, we should cut a stump a foot long, retaining the bark, with its thorns or spines, if it has them. If the trunk exceeds a foot in diameter, we may choose a middle-sized branch for a specimen, if it does not differ from the trunk; but if it does, we cut the trunk longitudinally, so that we may have one-half or one quarter of its circumference, but always from the pith to the bark.

When we meet with palms, ferns, or any other monocotyledonous tree, we should procure a stump of a foot long, whatever the diameter may be. If the palm be branchy, which is very seldom the case, we must cut the trunk six inches below the ramification and six inches above. Travellers are particularly requested not to neglect any opportunity of collecting palms, tree-ferns, dragon-trees (dracæna), pandaneæ, or trees similar to these.

In cases where it is impossible to have a portion of the trunk sufficient to convey an idea of its size, as the baobab, or the ceiba, we must take an exact note of the dimensions. The specimens of wood, when fresh cut, should be put to dry in places which are neither too dry, nor too warm, to prevent them from splitting.

Roots are only worth the trouble of collecting, when they present any thing remarkable in their structure, and then we take the same precautions as for woods.

Fleshy fungi ought to be treated like fleshy fruits, that is to say, preserved in spirits. Those whose nature allows them to be dried without much alteration, and *lichens*, ought to be treated like dried fruits; that is, either put into an herbarium, or dried apart. *Ferns*, *mosses*, *algæ*, ought to be dried and put into an herbarium. If time be wanting, the *mosses* may all be mingled together, and arranged after their arrival.

In the present state of science, travellers ought to pay great attention to the collecting small *cryptogamia* which spring on living vegetables. The greater part of the spots or excrescences which we see upon leaves, stems, or fruits, are worthy of being gathered and preserved. In this case, we ought to gather the leaf charged with the parasite, and a branch in flower of the same tree, to know its species.

Travellers will render an important service to science, by carefully collecting the monstrosities or permanent accidents of vegetables; such as the natural union of the organs of the same plant, which are generally separate; the organs which are abortive or altered in their form, their number, or appearance. These cases being out of the general rule, we cannot prescribe any precise method for their preservation; we can only observe, that at the side of each monstrous or diseased spe-

cimen, another ought to be added of the same species, in its usual state, to serve as a comparison.

By the side of our drawings, it is desirable to place a sketch of the general appearance of the whole individual; and if it be a tree, to add a scale of the size.

In our descriptions, if accustomed to the technical details of botany, we should be careful to note those particulars which are not easily seen in an herbarium, such as the exact insertion of the parts of the flower and the fruit, especially when the organs are very small; the precise construction of the grain, &c.

In climbing plants, when any species are found which resemble European, it is particularly necessary to notice which way they twist around their support; the traveller, supposing himself in the place of the support, his face turned towards the south pole, to ascertain if they ascend from right to left, or from left to right.

DESCRIPTION OF THE PLATES.

PLATES I. and II. referred to in the text.

PLATE III.

Fig. 1. The bird, with the incision for skinning and removing the body.

Fig. 2. The body removed; the skin turned inside out like a glove; legs and wings dissected; the skull skinned to the front, cleansed from the flesh, and the occipital hole enlarged for taking away the brains; *a*, the strings fastened to the beak.

Fig. 3. The bird with all the wires inserted.

Fig. 4. The bird fixed and bandaged.

PLATE IV.

Fig. 1. The oval or body-wire, the head-wire, the tail-bearer, and leg-wires, connected.

Fig. 2. The leg-wires separated.

Fig. 3. The tail-bearer separated.

Fig. 4. The oval and head-wire separated.

Fig. 5. The net for catching butterflies and insects when flying; the oval becoming perpendicular by a turn of the wrist, escape is prevented.

Fig. 6. Flappers for catching butterflies or insects on leaves or flowers. 1. Front view; *a*, the oval wire covered with cotton-net; *c*, the shaft to receive the

rivet; *b*, the bow for the thumb or finger. 2. Side view, to show the way of opening and closing the flappers, by means of the riveted handles.

Plate V.

Fig. 1. An instrument for the convenience of travellers, the upper edge of which, *a*, is sharpened for cutting specimens of the wood from the trunks or larger branches of trees; *b*, edged for severing the branches out of reach; *c*, blunt for hooking them down, for the sake of the leaf, fruit, or flower. This, with a small spade for digging up plants, may be carried in the waistcoat pocket, and the same handle will serve for them and the insect net.

Fig. 2. Shape of the larger hammer used for rocks.

Fig. 3. Smaller hammer enlarged, to show the direction of the upper edge, *a*, which must form a segment of the circle formed by the arm in striking, (to make the blow effective,) which depends of course on the length of the arm.

THE END.

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Fig. 2.

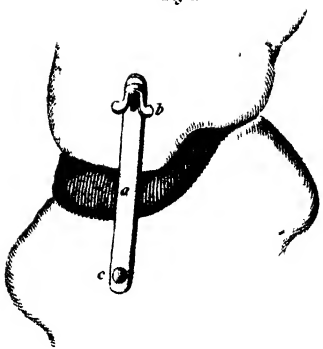
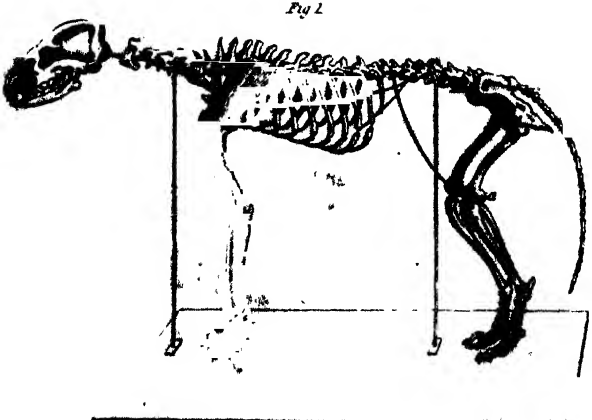
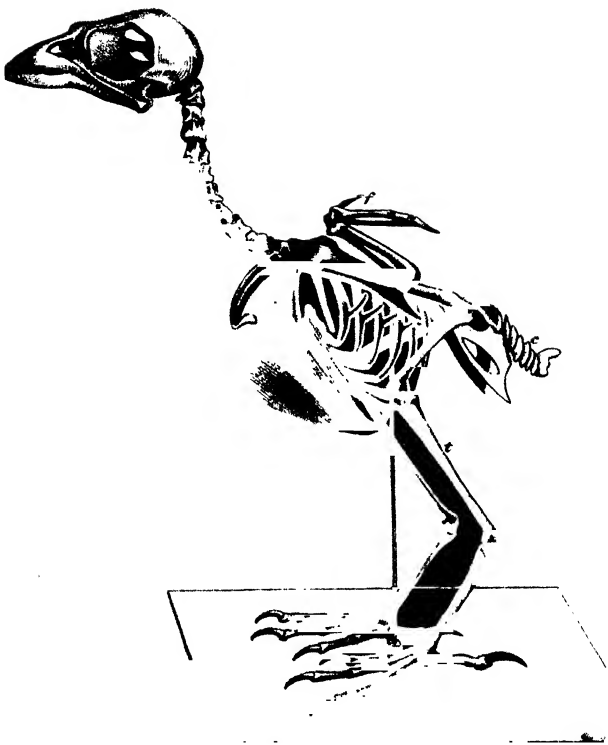


Fig 1



Wolf.

Published by Longman & C.ª Paternoster Row March 1800.



Common Sparrow.

Published by Longman & C. Paternoster Row. March 1st

Brookshaw del.

Fig 1

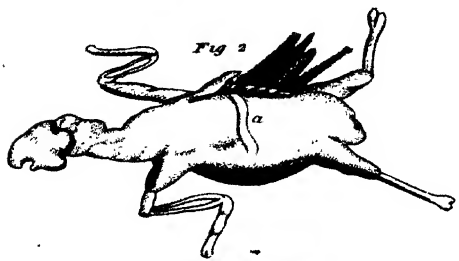


Fig 2

Fig 3

Fig 4

Plate IV.

Fig. 5.

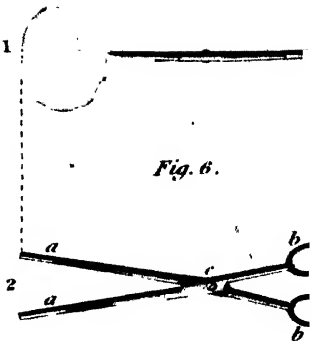


Fig. 6.

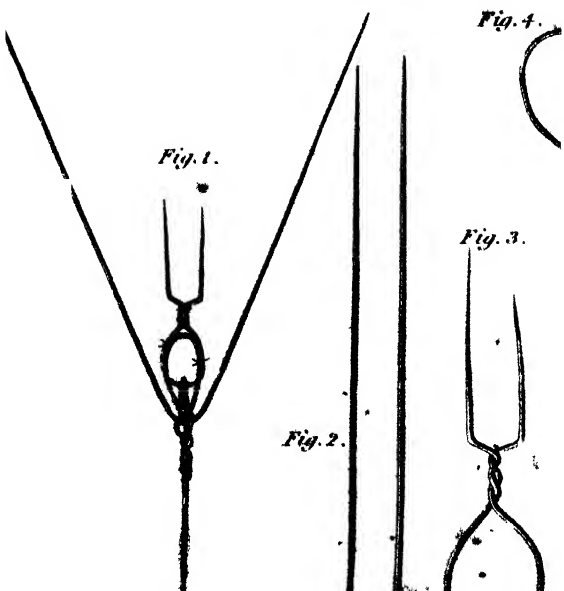


Fig. 4.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.

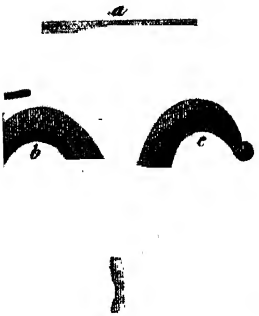


Fig. 2.

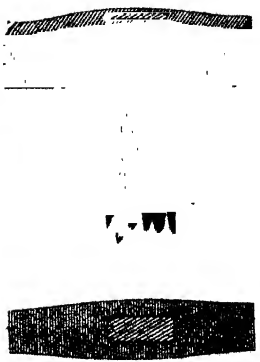


Fig. 3.